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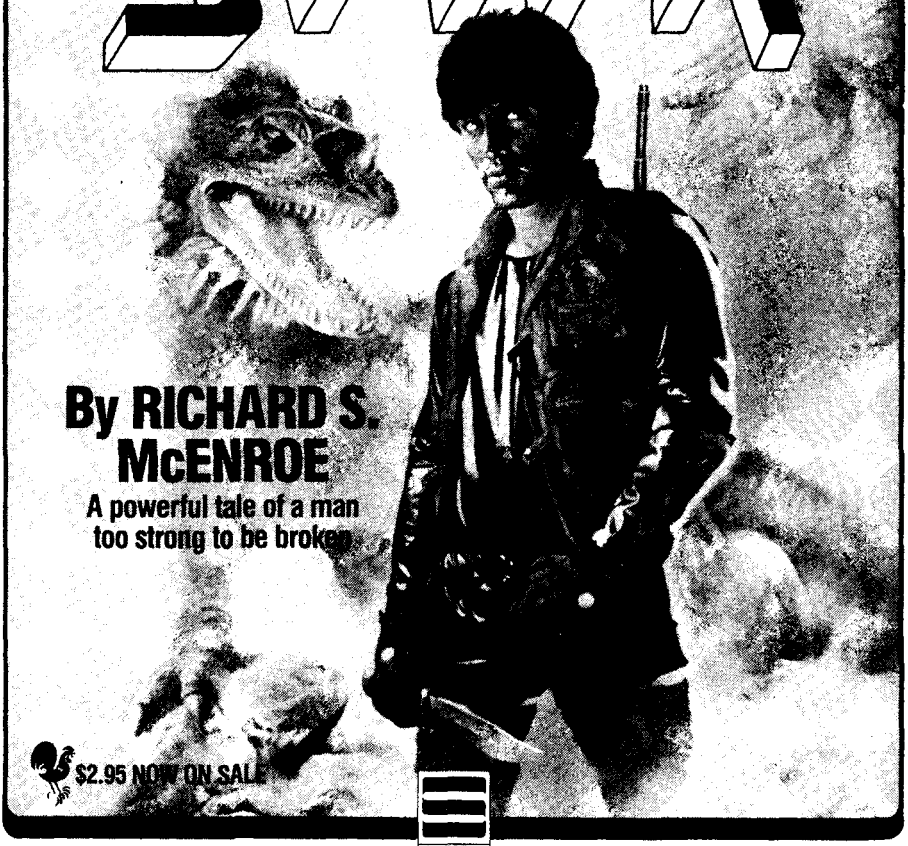

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Editorial

CORE CURRICULUM

Stanley Schmidt

Last December you probably read about a study titled *To Reclaim a Legacy: A Report on the Humanities in Higher Education*, produced by William J. Bennett and the National Endowment for the Humanities (NEH). The gist of it, if the summaries I've seen are accurate, can be roughly condensed into these statements:

1. At too many colleges and universities, students can graduate with little or no formal study of such fields as foreign languages and classical, European, and American history and literature.

2. At too many colleges and universities, too much emphasis is placed on "getting a job" rather than broad general education.

3. There has been an alarming drop in the number of students majoring in English, philosophy, history, and foreign languages.

4. The solution to these problems is, as *Time* Magazine phrased it, "the humanities restored as the centerpiece of a full four-year curriculum," with substantially increased and improved coursework requirements.

Well.

I'm certainly willing to agree that the concerns are worth thinking about, even after reminding myself that there's nothing surprising about a panel consisting largely of humanities professors coming up with a recommendation that would bolster the security of their own and their colleagues' jobs at a time when that seems in doubt. On the basis of my own observations of human nature in general and academicians in particular (having been one), I have little doubt

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that this consideration played some role in shaping their report. But I am not so cynical as to suggest that it was the *only* consideration. My firsthand observation of academic life also taught me that many people in any academic field are in it because they sincerely believe, for reasons to which they have devoted a lot of thought, that their subject is truly important for students to study.

None of which changes the fact that the NEH recommendations, like any others, are open to question and modification. Just glancing over the four points I have listed as cornerstones of the NEH report (and which, even if they are not truly that, *are* widely held beliefs), I find myself with the following immediate responses:

1. It is a documentable fact that many students can graduate from many institutions with the deficiencies charged. But is this necessarily bad? And are the alternatives worse?

2. Broad general education is a wonderful thing. So is being able to pay your own bills rather than depending on handouts. In our civilization (or any other ecosystem) an organism's ability to make a living is the one absolute prerequisite to anything else it may do.

3. Alarming to whom, and why? Are we to dictate that *n*% of students should major in this or that? Or try to make the declining majors more attractive? If that, then how? And might it be worthwhile to consider the possibility that there are valid, intelligent reasons for the decline?

4. *Should* the humanities be the centerpiece of everybody's curriculum? Even if we can agree that they should, are "the humanities" really equivalent to the subjects emphasized in the NEH recommendations? (Western civilization; English, American, and European literature; philosophy, and foreign language, which seems to mean predominantly Western philosophy and a handful of Indo-European languages.)

I can hardly quarrel with Bennett's vision of the purpose of a college education: "To enlarge and illuminate one's life." I *can* quarrel with the idea that what his panel recommends is the best way to do that. I can even fear that in too many cases it might have the opposite effect—and that the panelists themselves may have little inkling of this because their own backgrounds have a special kind of "breadth" which I see as a special kind of narrowness.

The humanities-centered curriculum of older tradition was the way it was (though hardly anybody involved in it would be likely to say so), in part because there wasn't a vast amount else available to be taught. Furthermore, it was widely believed that understanding the origins of one's own civilization was the best preparation for helping to shape its future. But at least two major changes in this state of affairs have occurred in recent history. One is that the sheer amount of accumulated knowledge has grown so much, not only within fields but by the addition of whole new ones, that hardly anyone can reasonably hope to gain a very profound acquaintance with all the fields that touch his life—and *nobody* is going to do it solely through four years in college, regardless of what courses he takes. The other big change is that the *rate* of change, in knowledge and in all other aspects of life, has increased so much that learning to cope

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with change *per se* needs to be a major goal of real education. I would agree that spending all of one's educational time preparing for a job constitutes excessive preoccupation with the present, if only because at present and projected rates of change, a job you spend all your time learning today may not exist in ten years. In addition to at least one currently marketable skill, you need the flexibility to move to new ones as the need arises. And while some things have remained constant enough through history to let the past shed light on the present, I don't believe that heavy concentration on the past of one small group of human cultures is, by itself, adequate preparation for the future. There is too much that's going to be truly *different*—and our local subset of cultures is going to be less and less able to cling to the delusion that it exists in isolation or that it is the only one that counts.

So what would *I* suggest as a core curriculum? The very first thing I'd suggest is a good dose of caution about the whole idea that there is very much that can or should be required as part of the college education of all students. There is only so much time in those four years, and every bit of it spent studying any given thing is unavailable for studying anything else. This does not mean that an education with both breadth and depth is so unattainable a goal that it's not worth striving for. It does mean that four years of formal instruction in college are not adequate to provide it. The function of college is to *start* the process by helping the student through a reasonably rigorous survey of enough fields, and a deep enough exploration of at least a couple of them, so that he'll have a good idea of what knowledge exists—*and how to continue exploring it on his own.* If enough serious emphasis is placed on the last point (and it seldom is), in the long run it may not matter a great deal *which* fields a student explores in some depth during the formal phase of his education. (In my own experience, I found my class time best spent on things like sciences, languages, and math, since those were the areas where I was most dependent on real-time interaction with an instructor and/or access to expensive special equipment. But somebody else may find that something quite different works better for him.)

As for breadth—William Bennett's "enlarging and illuminating"—I'm all for it. But on the one hand his panel seems to go too far in wanting to see this portion of the curriculum occupy a large part of the available time, and on the other hand not to go far enough toward *real* breadth. The powerful emphasis on *Western* (i.e., European and European-American) culture and languages seems to me excessively and unhealthily narrow. By all means, let's encourage, help, and occasionally maybe even require students to study things like English history, French language, and German literature. They should, as the Bennett panel suggests, understand something about where their own culture came from, how it got the way it is, and what its close relatives are doing these days. But they also need to understand that these few closely related cultures are by no means all of human-

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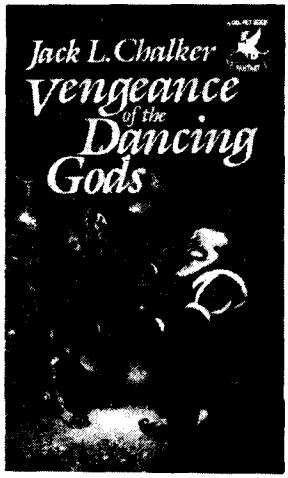

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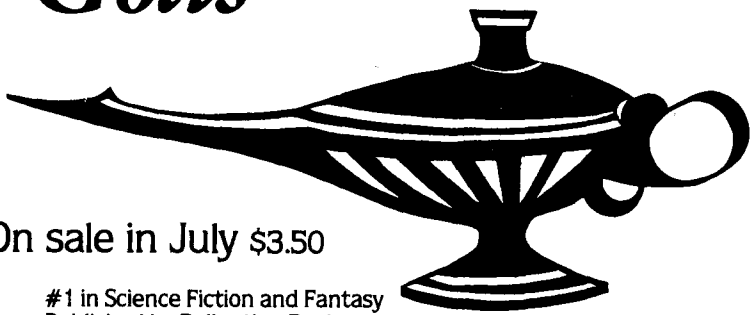

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ity. They need to see something of how the world looks to *other* cultures, as unrelated as possible to our own. Only then will they have much chance of producing the intercultural understandings that will be necessary to the continued survival of all of us in the future. And they need to understand, at least dimly, how all of us are ultimately subject to principles that far transcend not only any culture but any *species*—and that all humankind, however important it may be in its own eyes, is a pretty small part of the universe and time.

So my recommendations for a core curriculum—which I advocate less as rigid requirements than as strong recommendations to students and their advisors—would be a little different from those of the NEH. I want to see many students getting some exposure to the things their report mentions—but I don't want to see them spending a lot of time delving into a particular literature (unless they have a particular interest in it) until they've had as many as possible of the following:

1. Some solid training in clear, precise communication in their own language—and far too many literature courses I've seen not only fail to satisfy this requirement, but actively undermine it. Good communication requires careful writing (or speaking) *and* careful

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reading of what was written. Careful reading does *not* include inventing all manner of fanciful interpretations of "what the author was trying to say." —but that's exactly what it takes to get good grades in many lit courses. And I can't help suspecting that that kind of "education" has something to do with the tendency I see so often for people to argue passionately against something which in fact was neither said nor implied.

2. A decent grounding in physical science, including at the very least the fundamentals of physics, chemistry, astronomy, and how they fit together —presented in a way that makes it vividly clear that these principles are *very* pertinent to every aspect of everyday life.

3. A decent grounding in *biological* science, including in particular some real understanding of ecology and how humanity fits into it.

4. A realistic awareness of the range of what "humanity" can mean—*not* a one-sided presentation of "Western" civilization as the only kind worth talking about, but a survey broad enough to include some cultural anthropology and non-Western philosophy and at least one *non*-Indo-European language in enough depth to sample its literature.

This list does not pretend to be exhaustive; I can easily think of other things that might go onto it, and you probably can, too. But I'm trying to bear in mind (having participated in a real curriculum reform or two) the constraints of time. A curriculum should not be *all* survey; it needs ample room for "depth," for the student really to get into a major or three—and I stubbornly believe the choice of major(s) should be his. What NEH and I are both talking about is the other part of the curriculum—the part whose main function I see as introducing students to the scope of human knowledge, with the hope that they will pursue at least some parts of it in more depth later. If a certain number of hours are available for that task, my version will not allow all students to do everything the NEH thinks they should—or vice versa. But mine, I think, is a good deal more "enlarging and illuminating."

Of course, it's not complete without one final recommendation—for a course (or equivalent of alternative form) that I don't recall seeing as a standard part of *any* curriculum. One of the things I find most disturbing about most educational systems I've seen is the tacit but pervasive belief that education must be formal to be real—that it's necessary to take a course to learn a subject. Encouraging, or even allowing, students to believe this does them a terrible disservice. Colleges can be a big help in getting students well started on learning—but with the extent of knowledge already in hand, and the rate at which it's growing, there's no way they can finish the job. What they *can* do, but in practice too often don't, is convey the realization that students *can* continue the process quite effectively on their own, for as long as they live. If a college can provide a way of getting that message across, together with a confident grasp of workable methods for putting it into practice and an awareness of the joy and other rewards of doing so—*that* is a centerpiece worthy of any curriculum. ■

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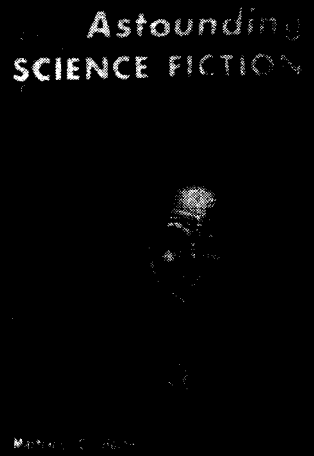

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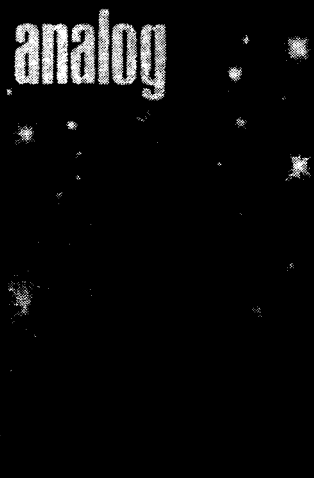

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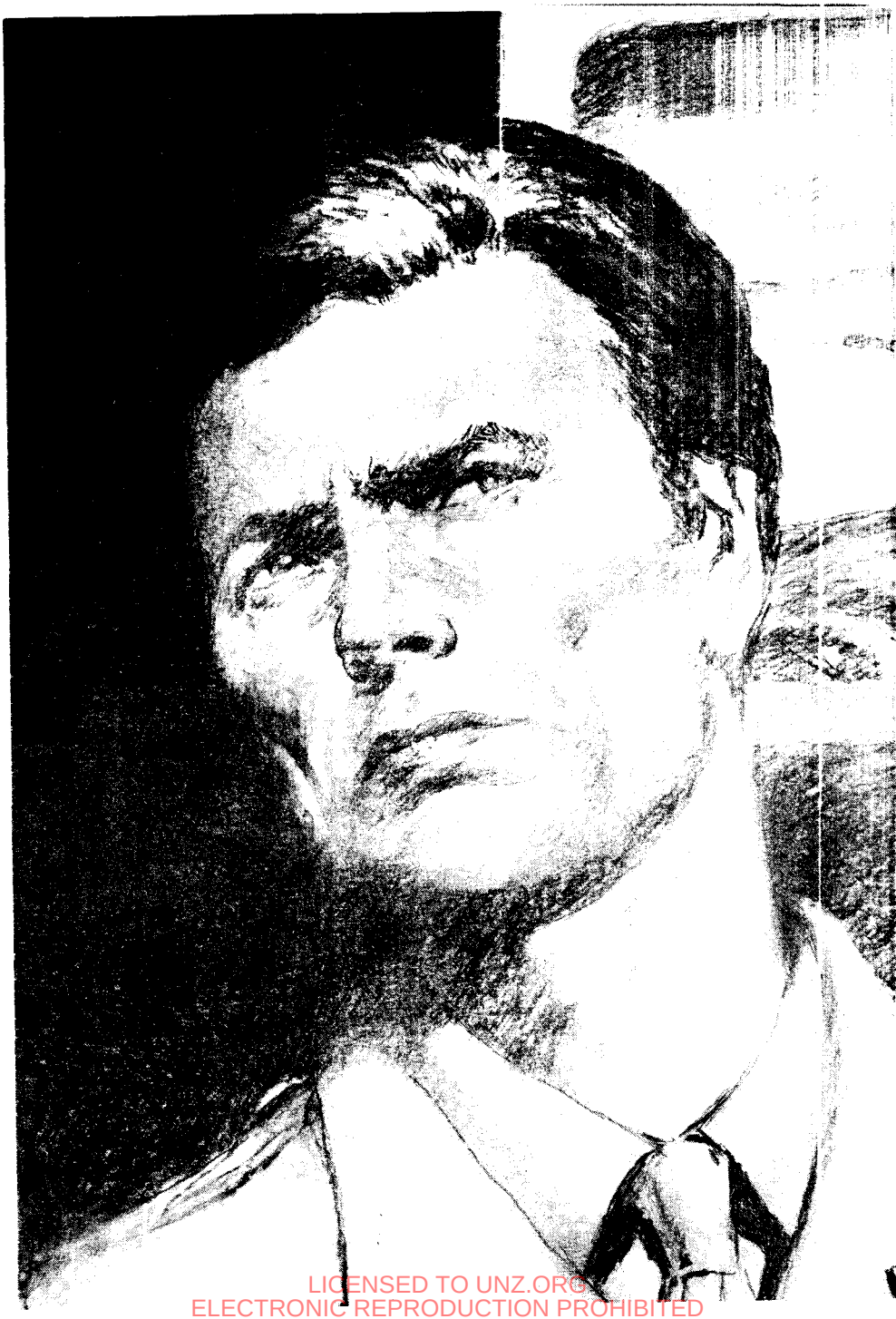

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Part One of Four

SPINNERET

Timothy Zahn

Man's first FTL starships opened the way to a lot of new real estate, but unfortunately most of it was occupied. Except for one very peculiar planet. . . .

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Prologue

His only regret, Captain Carl Stewart thought as he stood on the bridge of America's first starship, was that there was no bottle of champagne available to smash against the U.S.S. *Aurora*'s side.

The ceremony would have been impractical, of course, even if the State Department had cleared it. In the airless cold of space, the bottle would have required special preparation to keep it from either freezing solid or exploding prematurely, and that kind of reinforcement might easily have kept it from breaking properly and on cue. With the launching ceremony being beamed live to the entire planet—and the 2016 elections barely ten months away—no one wanted to risk that kind of fiasco. Still, the sea and its traditions ran four generations deep in Stewart's blood, and it seemed wrong somehow to leave home without a proper christening.

The drone from the TV monitor stopped. Stewart brought his attention back to the screen in time to see President Allerton lay a hand on the switch by his podium. "Stand ready," he ordered, watching the image. An unnecessary command: the *Aurora*'s crew had been ready for hours.

". . . and with all of our hopes, prayers, and dreams riding with you, we send you forth to search out the new frontier; to find new worlds, new opportunities, new solutions; to invigorate and challenge the human race again to greatness. Godspeed, *Aurora*." With a final flourish heavenward, Allerton threw the switch—

And, five thousand kilometers above him, the spotlights attached to the workframe scaffolding blazed with light, providing the TV cameras with their first clear view of the *Aurora*.

Stewart gave the dramatic moment a count of five, and then nodded to his helmsman. "Ease her out, Mr. Bailey," he ordered. "Mind you don't wing the *Pathfinder* on the way."

Bailey grinned. "Aye, sir," he said. Slowly, moving on its cold-nitrogen docking jets, the *Aurora* left the workframe's snug confines. It passed well clear of the *Pathfinder*'s workframe — Stewart noticed peripherally their nearly completed sister ship flashing its running lights in salute—and drifted off toward the barely visible horizon of the dark world rolling beneath them. "Lot of lights showing down there," Reger, the navigator, commented.

"Lot of people down there to use them," Stewart grunted. And the scientists with their fancy telescopes and theories had better be right, he added silently to himself; there had better *be* more planets out there for the *Aurora* to find.

"Clear for shift," Bailey announced, looking over at Stewart. "Course vector less than five second deviation."

"Acknowledged," Stewart nodded, putting his fears for Earth's survival out of his mind. "Make it good for the cameras, Mr. Bailey: *shift!*"

And with a flash of sheet-lightning discharge through every viewport and vision sensor, the stars vanished into the absolute black of hyperspace. Next stop, Alpha Centauri.

Mankind was on its way.

"It certainly has every reason to be Earth-like," astrophysicist Hashimoto

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commented, his stubby fingers dancing lithely over the readout screen. "Position should give reasonable temperature, size is within a few percent of Earth's, and we're getting a strong oxygen reading even at this distance."

Stewart nodded, refusing to get his hopes up too high. In the six systems *Aurora* had so far visited, there'd already been one false alarm. "We'll continue on course; that should get us close enough for better readings. If a landing seems warranted—"

"Captain!" Bailey barked, his voice tight and half an octave above normal. "Something on the screen—moving fast!"

Stewart spun around in his chair . . . and froze. Coming out from behind the crescent of their target planet was a slowly moving star. Seconds later it was joined by a second . . . and a third.

Spacecraft!

"I'll be damned," Hashimoto gasped.

Stewart found his tongue. "*Shift*, Bailey. To hell with alignment—we can get back on course later."

"Wait a second," Hashimoto said — but with a flash the planet and moving stars vanished. "Captain!"

"As you were, *Mr.* Hashimoto," Stewart snapped, leaning on the title to remind the scientist of his temporary military position. "My orders are explicit on this point: in case of contract with non-humans, I am to run if at all possible."

"But an *alien race*." Hashimoto was clearly in no mood to back down. "Think of the opportunities, the—"

"The *Aurora* is equipped for neither battle nor negotiation," Stewart interrupted. "The diplomats can follow us once we've made our report; I hardly think the aliens will disappear in the next two months. I suggest you start analyzing the data we picked up and see if you can figure out just how Earth-like that planet really was. We'll want to know how interested the aliens are likely to be in *our* real estate before we make contact again."

Hashimoto's glare slipped into a thoughtful grimace: nodding, he left the bridge.

Stewart turned back to the gentle light of the displays, silently mouthing a word he'd once heard a Marine drill sergeant use. So life *did* exist out here . . . and if it existed so close to Sol, it must be pretty common, to boot. Perhaps a whole interstellar federation was sitting virtually on mankind's doorstep—a cosmic club whose members could finally give humanity the answers it so desperately needed.

It wasn't until much later that the other possible consequence of the "cosmic club" occurred to him.

The hiss of the landing jets died into a ringing silence in Captain Lawrence Radford's ears. Popping the release on his harness, he carefully rose to his feet, feeling awkward after three weeks of the *Pathfinder*'s zero-g. "Start pre-launch check," he ordered the shuttle's pilot. "And get the atmosphere tester going, too."

"Yes, sir."

Stepping around his chair, Radford made his way to the airlock door, where the rest of the landing party was assembling. "Looks beautiful, Captain," Lieutenant Sherman smiled, reaching

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up to fasten Radford's helmet to his suit neck. "With all that green out there, it *has* to be running on chlorophyll."

"We'll find out soon enough." Carefully, refusing to rush, Radford completed his pre-EVA suit check. Then, giving the rest of the team a thumbs-up gesture, he stepped into the airlock. A ninety-second eternity later, the outer door snicked open . . . and Captain Radford of the U.S.S. *Pathfinder* stepped out onto mankind's first colony world.

He'd thought a lot about this moment, and he was ready. "In the name of—" He stopped short, the words dying in his throat.

"Captain?" Sherman's voice asked tentatively.

"All outside cameras on," Radford ordered quietly, wondering if the words would be audible over the thunder of his heart. The alien who had risen from the waist-high grass fifteen meters away was holding an oddly-shaped metal device . . . and if it wasn't pointed directly at Radford, it wasn't off by very much.

"Uh-oh," someone muttered. "Captain—we're surrounded."

"Acknowledged," Radford said. "Kyle, are you getting all this?"

"Perfectly," the clipped voice of the *Pathfinder*'s first officer said. "We're on full alert; no sign of spacecraft up here."

"Yet," Radford added tensely. The aliens—he could see four more, now, in backup array behind the first one — were definitely wearing clothing of some sort, and the devices they held were identical enough to have been mass produced. No primitives, these—and the fact that the *Pathfinder* had spotted no traces of widespread civilization from orbit strongly suggested the aliens were themselves visitors here. "All right. I'm going to try backing into the airlock. We'll lift as soon as I'm aboard. Kyle, get the ship ready to shift."

"We'll be ready by the time you're back."

"Make sure you're ready before that," Radford said, "because if any alien spacecraft appear you're to take off immediately. We're expendable; the information you've got isn't."

"Yes, sir." Kyle didn't sound very happy with the situation.

Radford wasn't especially thrilled with it, either; but as it happened the necessity for heroic self-sacrifice never arose. The aliens watched impassively as Radford eased back through the door; the shuttle regained orbit without anything like fighter aircraft appearing; and all screens were still clear as the *Pathfinder* shifted into hyperspace.

"Damn rotten luck," Kyle growled as they reviewed the films of the aliens later. "The place was absolutely perfect."

"We don't know that for sure," Radford reminded him. "Anyway, finding out man isn't alone in the universe is at least as important as finding new planets to colonize."

"*If* they're friendly, you mean."

"If they're not, at least they don't know where we came from." Radford touched the rewind control. "Cheer up, Kyle—chances are good we'll find something else before we head home. And even if we don't, either the *Aurora* or the *Celeritas* is almost certain to."

"Maybe."

* * *

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"Beautiful." Mario Civardi smiled at the planet centered in the telescope display. "Simply beautiful."

Captain Curt Korczak supressed his own smile at the Italian's exuberance, which echoed his own, more private feelings. The European Space Agency had taken a lot of knocks for the delays that had enabled the Americans to launch their two ships first; but the *Celeritas* had just paid back the skeptics, with interest. A brand-new world, where mankind could start over again with a clean slate. No pollution, no acid rain, no overpopulation, no nationalistic posturing. It was almost like getting into Eden again.

"Captain!" the man at the radar shouted suddenly. "Something approaching from astern—"

The main vision screen flashed with light as something with a fiery tail shot over the *Celeritas* and vanished far ahead. "What the *hell!*" First Officer Blake gasped. "That was a bloody *missile.*"

"Backtrack it," Korczak snapped. "I want to know where it came from."

"Got it, sir. Bearing down on us from—"

The chair slammed hard into Korczak's spine and a dull roar rattled his teeth. "Shift, Civardi!" he managed. "Get us out of here!"

And, for a miracle, the equipment worked. Safe in the blackness of hyperspace, the *Celeritas* limped toward home.

"I don't believe it." President John Kennedy Allerton shook his head, laying down the report. "Fifteen reasonably Earth-like worlds, and *every* one already occupied?"

General James Klein shrugged. "I agree it's pretty hard to swallow, but the *Pathfinder*'s films can't be argued with." He hesitated. "I've also heard that the E.S.A.'s *Celeritas* showed signs of damage when it got back early this morning, so I'd guess they ran into them, too."

Allerton pursed his lips tightly. "If that's true we'll want an immediate meeting to compare notes. Probably better bring the Soviets and Chinese in on it, too. An alien race hemming us in on all sides isn't something we can afford to play politics with. I suppose we should tell the UN, too."

Admiral Davis Hamill snorted. "The Russians won't believe a word of it, at least not until they get their own first-hand data, and Chinese security is so lax these days that if we tell *them* we might as well broadcast it to the Islamic Confederation and the Africans. I can just hear what *they'd* say."

Allerton smiled faintly. "You take the tirades at the UN too seriously, Dave. The Third World may think we're the cause of all their problems, but there's really no way they can blame Project Homestead's failure on us."

"They can blame us for alerting the aliens that we're here, though," Klein pointed out.

"Oh, come on—they surely already know we're here. They *surround* us, for heaven's sake. If they wanted to fight they would've moved in years ago."

"What about the *Celeritas*?" Klein objected.

"What about the *Pathfinder*? The aliens let *them* go."

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Klein's rejoinder was lost in the simultaneous buzz of all three men's phones. Twisting his wrist to point the directional speaker at his face, Allerton clicked the switch. "Allerton."

"Situation room," a tense voice answered. "Sir, we've picked up a flash of light from a point near Mars orbit. We think it's a star ship . . . except that the flash was red, not blue-white."

Allerton looked up to meet Klein's and Hamill's hardening expressions. The shift flash represented wasted energy . . . and the lower-energy red burst meant the newcomer had a drive far more advanced than anything on Earth. "Full military alert," the President ordered quietly. "World-wide. Prepare for possible invasion. I'll be down there shortly to take charge."

He signed off. The two military men, still talking into their own phones, were already heading for the door. Thumbing the White House operator, Allerton got to his feet and followed. "Get me the Kremlin, Chinese Premier Sing, and UN Secretary-General Saleh—conference call, scramble, and rush it."

The long star ship drifted delicately into high Earth orbit shortly afterward, stifling the Soviets' official disbelief and touching off near-panic all across the globe. But the end of the world didn't come on the anticipated schedule. Instead, the alien briefly blanketed the airline radio frequencies with a message, in passable English, requesting a conversation with Earth's leadership.

Considering the norm of international politics, the response to that call was remarkably swift.

". . . We welcome you on behalf of the Security Council, the United Nations, and the entire Earth. We look forward to the mutual exchange of knowledge and culture, and to a growth of true friendship between our peoples."

Secretary-General Hammad Ali Saleh sat down in his chair at the head of the semicircular table and reached thankfully for the water glass at his elbow. He hadn't been this nervous in thirty-five years, not since the Iran-Iraq border wars of the early '80s. Then, he'd been a young Yemini volunteer recognizing on an emotional level that the shells dropping out of the sky could kill him very dead. Now, his position was uncomfortably similar. No one knew why the alien wanted to talk to mankind's leaders, but the *Celeritas*'s experience suggested the answer might not be a pleasant one. Certainly the superpowers thought so; all three had voted in favor of letting the UN take the hot seat. Point man, stalking horse . . . the expendable ones. Sipping his ice water carefully, Saleh consciously relaxed his jaw and waited.

"The Ctencri greet you in response," the voice came abruptly. "It is ever an honor to welcome a new people into space. Your race has advanced greatly in the eight hundred years since you were last studied. It is hoped that we may find a solid base for trade and mutual profit."

Something in Saleh's chest seemed to loosen up slightly. Trade and profit were business, not political terms. Was this, then, merely a trading expedition? Saleh couldn't decide whether he would feel relieved or annoyed if the Ctencri government had indeed left their first

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contact with Earth to the Aliens' version of AT&T.

Whoever it was out there, though, he had one very important point to clear up right away. "We would certainly be interested in discussing trade possibilities," Saleh said. "However, we have several questions we would like to ask first. Foremost among them is why your ships fired on one of our unarmed probes."

There was a short pause. "The question is meaningless. The defense units of Hreshtra-cten did not use force. Your lander was allowed to leave peaceably."

"You're refering to the incident with the *Pathfinder*," the American delegate spoke up from halfway around the table. "The *Celeritas* was in a different solar system when it was attacked."

"Only one ship entered Ctencri territory," the alien said. "The other presumably breached another people's region."

Saleh blinked. *Two* alien races . . . and both within ten light-years? The American president had implied it was a single race that surrounded Earth, not two or more. Honest mistake or deliberate deception? "Perhaps you can help us contact the other . . . people," he said, fighting to get back on balance again. "Or at least assure them we weren't attempting an attack on their territory. We seek only to find new worlds—unoccupied worlds, of course—that we may peacefully colonize."

"That will be impossible."

"Why? Don't you have communication with them?"

"Pardon; you misunderstand. We will certainly aid you in contacting the other peoples. It is your seeking of worlds to colonize which is impossible."

Saleh frowned, his stomach tightening up again. "I don't understand."

"All suitable worlds are already occupied."

There was a moment of dead silence. "Occupied by whom?" the British delegate demanded.

"Many by their indigenous peoples," the Ctencri said. "Such worlds are closed to outside contact, as was yours until now. The remainder are occupied or claimed by space-going people such as ourselves."

"How many space-going races *are* there?" Saleh asked.

"The Ctencri have direct contact with nine others. The existence of seventeen more is known second-hand. We believe there to be many others."

The Russians didn't believe it, of course. Neither, to a lesser extent, did the Americans and Europeans. The star ships were sent out again, in new directions. And again. And again.

Eventually, they were all convinced.

"So this is it," Saleh said, leaning back in his chair and gazing out the window at the lights of New York. They were glowing brightly, as usual, and the Yemeni felt his usual twinge of anger. The work at Oak Ridge and Princeton in the last century had guaranteed that the U.S., at least, would not starve for energy for a long time to come . . . but the rest of the world still waited for the promised sharing of that technology.

Someone cleared his throat, and Sa-

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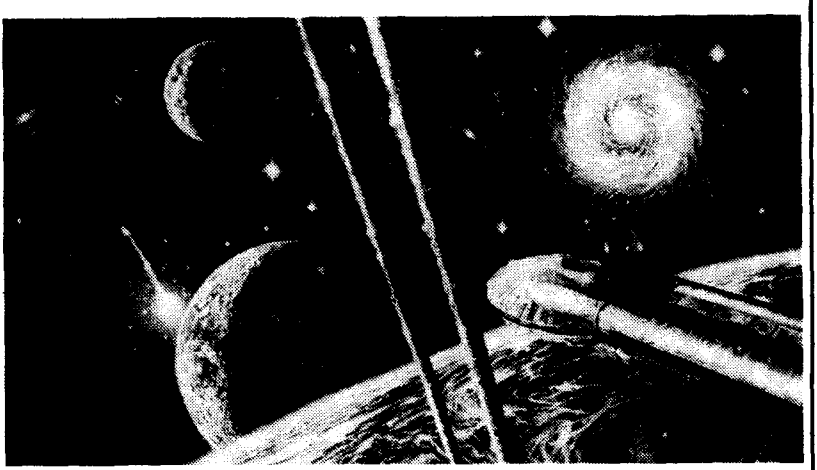

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leh shifted his attention back to the five heads of state he'd invited to this meeting. "This makes no sense at all," Japanese Prime Minister Nagata said, laying down a copy of the report. "An Earth-type world complete with water and a breathable atmosphere and *no metals?* That's absurd."

"I only know what the Ctencri said." Saleh shrugged. "It's *because* the planet hasn't got any metals that we've even got a chance at it—otherwise the Rooshrike would have found a use for the place long ago."

"Could this be some sort of elaborate trap?" Premier Sing of the People's Republic asked. "I understand the Rooshrike are the ones who fired on the *Celeritas*."

"According to the Ctencri, the Rooshrike simply act impulsively at times," Saleh told him. "Apparently, they jumped to the wrong conclusion when the *Celeritas* didn't give the proper identification signals. I've been assured that's all straightened out now."

"Less likely a trap than a swindle," Russia's Liadov rumbled. "How much would the Rooshrike and the Ctencri want for this worthless lump of mud?"

"Nothing humans can live on is completely worthless," President Allerton said mildly, a soft gleam in his eye.

The Russian snorted.

"The cost actually isn't that bad," Saleh said. "It would come out to eighty million dollars' worth of certain relatively rare elements—the list of acceptable purity levels is on the last page. For that we would get a hundred-year lease with renewal option." He paused. "Which brings us to the reason I've asked you here tonight. The rental fee would only be the tip of the iceberg if we intend to actually do anything with this world. Homes would have to be built, crops planted, industries started, colonists screened and trained—it would be a tremendous project."

"And so you've come to us for money," British Prime Minister Smythe-Walker put in dryly.

"Yes," Saleh nodded without shame. "The UN budget can't support something like this, let alone organize everything—we simply haven't the funds or manpower. We would have to contract out parts of the operation, which would take even more money. So before I even bring this up to the Security Council and General Assembly I need to know whether or not the money will be forthcoming from those who *can* afford it."

"Why bother?" Liadov shrugged. "You ask a great deal for the privilege of flying the UN flag on a world with less economic value even than Venus. You would do better to fund expeditions to the Jovian moons."

"You overstate the case somewhat," Sing said, "but you are essentially correct. This world does not seem worth its cost."

"Crops won't grow without traces of metal in the soil, for starters," Nagata put in. "All food would need to be imported. And what could they export in exchange?"

"Other minerals," Allerton said, still skimming the report. "One of the continents appears to be ringed with underwater mineral deposits."

"What, silicates and such?" Smythe-Walker shook his head. "Sorry, John, but it's hard to imagine any rock formations worth carting up a gravity well

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and across forty light-years of space. And there's still the thing with food, unless you want to add a few tons of iron and manganese silicates to the soil before you plant."

"Why not?" Allerton countered. "It's not as impractical as you make it sound."

"No—but it *is* expensive." Smythe-Walker looked at Saleh. "I'm sorrry, but I don't believe His Majesty's government will be able to guarantee any support for such a project."

"Has it occurred to you—to any of you," Allerton added, glancing around the table, "that this whole thing *might* be some sort of test? That our willingness to take on what seems to be a hopeless task may be how all those aliens out there judge our spirit and ingenuity?"

"More likely testing our intelligence," Nagata murmured.

"I have an idea," Liadov spoke up. "As Mr. Allerton seems to be the only one of us interested in demonstrating mankind's resolve to our new neighbors—and as he is so fond of invoking Yankee ingenuity as the solution to all our problems—I suggest we give the United States a UN mandate to develop and administer this world. With a certain amount of UN support, of course."

For a long moment Allerton stared hard into the Russian's impassive face, and Saleh held his breath. He'd been in the vanguard of the Islamic Confederation's vocal attacks on the Americans' Homestead Project, but such political necessities hadn't kept him from secretly hoping the search for new worlds would bear fruit. A new frontier —whether intended as a private preserve for the rich or not—would give hope to all those who felt themselves trapped into ancient patterns without the possibility of escape. Four years ago he'd dreamed of a UN that could build its own ship to fly with the Canadians' newly discovered star drive; two years later he'd finally admitted defeat. Rhetoric and Third World support were no substitutes for money, and the West was ever more selfish these days with their wealth. But if Liadov's goading succeeded. . . .

"All right," Allerton said abruptly. "If I can get Congress to approve, we'll do it. *And*—" he leveled a finger at Liadov—"we'll do it *well*."

The next day the matter was brought before the General Assembly, which endorsed the mandate by a 148 to 13 vote. A month later the U.S. Senate followed suit, and the world newly christened Astra became the center of perhaps the biggest project the Army Corps of Engineers had ever undertaken.

Eleven months after that, the first colonists arrived.

Chapter 1

From orbit Astra resembled nothing so much as a giant mudball on which someone had thoughtlessly spilled a bucket or two of pale blue paint. Both of the continental land masses were as dead-dull-bland as anything Colonel Lloyd Meredith had ever seen. No reds, certainly no greens; just the occasional blue of a lake or a line of white-capped mountains. Even the continental shelf mineral deposits upon which the planet's future industry depended so heavily came out as a blue-washed white. "I wish we'd brought some paint," he commented to the man beside him.

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Captain Radford snorted mildly. "You'll get used to it," he said. "I think you'll find you've got bigger problems down there than lack of decent scenery."

"No doubt," Meredith conceded. Radford had been ferrying workers and equipment back and forth for nearly a year now and undoubtedly knew more about the place than Meredith, who'd spent that same period up to his zygomatic arch in organizational details for the permanent colony. "Are we anywhere near the settlement? My map-reading courses never included looking at the terrain from this height."

"We're just coming up on it now." Radford indicated the western edge of the continent below. "You see that sort of four-fingered bay, with the big island just off it? That's the place. Right near the mineral deposits, with several feeding rivers for fresh water and the sheltered areas of the bay for fish breeding. The main military base and landing facilities are on the island; the towns are on the bay or within a dozen kilometers of it."

"Um." Meredith's eyes traced the line of mountains arching into the bay from the southeast, shifted to a solitary shadow fifty kilometers or so due east of the settlement. "What about that volcano?"

"You mean Olympus? No sweat—the thing's been dormant for centuries."

"Yes, that's what the preliminary report said. Anybody done a more careful check of it since then?"

"I don't know. You've got your own geologists, though, don't you? I'm sure they can put your mind at ease."

Meredith pursed his lips momentarily at the other's faintly patronizing tone. A lot of the colonel's colleagues thought him overly cautious on the subject of volcanos . . . but then, none of them had seen first-hand the aftermath of the '88 Izalco eruption that had killed four hundred people in El Salvador. "I'm sure they can," he told Radford evenly. "All right. How soon can we launch shuttles and start getting this crowd down?"

"Any time you and the crowd are ready," Radford said. "As far as I'm concerned, the sooner the better."

Meredith nodded understanding; there'd been a lot of tension aboard ship the past three weeks. "They'll calm down once they've got room to move again."

"I hope so—for your sake." Keying his intercom, Radford began issuing orders.

Seen from ground level, Astra's color scheme wasn't markedly improved; but Dr. Peter Hafner didn't especially care. He'd studied all the photos and read all the soil analyses, but there was nothing that could compare to seeing the rocks close-up and personally handling them. Leaning over the hovercraft rail, he gazed at the low cliffs flanking the narrow entrance to Splayfoot Bay, eyes tracing the subtle variations in hue and wondering about their composition. For the moment speculating was all he could do; the extreme scarcity of metallic elements in Astra's crust opened the way for compounds never before suspected, let alone seen. He could hardly wait to begin work on them.

The hovercraft cleared the bay's entrance and headed toward the eastern-

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most of the three main arms. Hafner caught a glimpse of a settlement up in the northern branch, but it was too far away for him to pick out any details. A few minutes later the craft entered the eastern arm, and Hafner saw that there was another collection of buildings at its far end. The majority seemed to be built along the lines of row houses, though there were a few larger ones that probably served as community or storage facilities. The construction material was obvious: some sort of adobe, probably baked in slabs for faster construction. Undoubtedly efficient, given the lack of wood, but the drab result was pretty grim.

Beside him, two Hispanic-looking men were also squinting at the town ahead. From the tone of their muttered Spanish Hafner decided they were similarly unimpressed by its appearance. He wondered if anyone had thought to bring along any house paint; decided regretfully that such a consideration would rank low on military priority lists.

For the moment, though, the clothing of the people milling about added color to the scene. A small crowd was gathered near the dock, where one of the other hovercraft was still unloading. Hafner's craft slid into position on the opposite side of the welded metal pier, and the scientist joined the rest of the colonists streaming ashore.

The crowd turned out to be the queue for a sort of open-air check-in station the military had set up. Hafner took his place at the end of one of the lines, thankful that the Army had had the sense to give the colonists some time in the open after the cramped conditions aboard ship.

The sun was directly overhead—noon of a twenty-seven-hour day—and now that the mountain foothills blocked the stiff ocean breeze the air was beginning to warm up. Hafner slipped off his jacket, wondering idly how good the meteorologists' seasonal predictions really were. Astra's smaller axial tilt should give milder temperature swings than those of Hafner's native Pennsylvania, but with barely a year's worth of data to go on, the planet's climate was far from established. Certainly it seemed hotter now than the early spring this part of Astra was supposed to be in at the moment, and if this wasn't just a temporary heat wave even the tough hybrid crop strains they'd brought with them might be in trouble. He hoped the experts had taken such possibilities into account.

Finally, it was his turn at the front of the line. "Name?" the sweating lieutenant asked, not bothering to look up from his portable terminal.

"Peter Hafner. I'm a geologist with Dr. Patterson's group—"

The terminal spat out a small card. "Hafner, Peter Andrew; 1897–22–6618; science/professional." The soldier handed Hafner the card. "House number 127 here in Unie; maps are posted in the courtyard over there; meal and orientation meeting times are on the bulletin board beside the maps. Questions will be answered at the meeting tonight; emergency questions can be handled at the admin complex. Next!"

Well, at least they've got things organized, Hafner thought as he headed toward the knot of people around the bulletin board. For a moment he considered finding the admin complex and

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seeing if they would tell him where Patterson would be living. But they were probably up to their necks in work over there, and there was no point making a nuisance of himself any sooner than necessary. The meeting tonight would be soon enough to find Patterson and discuss the work schedule; until then, he would do well to put a leash and choke collar on his eagerness. A quick look at his new quarters and a long walk around Unie should do him for today. In fact, if his luggage had been delivered to his house yet, he'd even have his sample boxes and a handful of reagents to take with him.

Smiling, he picked up his pace. Perhaps the afternoon wouldn't be a total waste, after all.

The stars were shining like frozen sparks overhead as the Ceres town meeting broke up, their brilliance seemingly unaffected by the handful of lights that defined where the streets were alleged to be. Cristobal Perez walked slowly toward the house he shared with two other men, the work orders they'd passed out in the meeting crinkling in his pocket as he moved.

A footstep scrunched the gravel behind him: someone overtaking. Turning, he caught a glimpse of the other's face. "Matro," he nodded in greeting. "How do you like your new home so far? A true land of opportunity, *si*?"

Matro Rodriguez snarled an old Nahuatl curse Perez had often heard him use. "Farming. *Farming!* We came all this way just to be put to work in fields like migrants?"

"I told you not to expect too much." Perez shrugged. "If you'd ever been in the Army you would know that *all* recruiters lie through their teeth."

"We might as well *be* in the Army. Or haven't you looked at the list of rules yet?"

"I looked at it. What did you expect —that we would be the new Pilgrims here, get to do anything we want?"

Rodriguez didn't seem to be listening. "Did you notice how practically everyone in Ceres is Hispanic? And how they've got us three to a house? I was behind one of the middle-class science types in line this afternoon—*he* got a house all to himself in Unie."

"Well, at least *we've* got our own lake."

"I'm overjoyed," Rodriguez said sourly. "The Anglos'll probably sit around it while we dig irrigation ditches to the fields."

"You're getting yourself worked up for nothing. All right, so they're treating us like peons—now. But there are a lot more colonists than there are soldiers, and I don't suppose the Anglos will be thrilled by Army rules for long, either. As long as we stick together we can make this place what they promised us it would be."

Rodriguez gave him a hard look. "You were always a pretty good talker, weren't you? I noticed you didn't say any of this at the meeting when they ordered us into the fields."

"Of course not—we've *all* got to eat, haven't we? But the time will come, Matro, and when it does *we'll* be the ones bargaining from strength. Trust me."

The other snorted. "Sure. But I won't believe it until it happens. *Buenas*

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noches." Lengthening his stride, he disappeared into the gloom.

Perez watched him go, feeling his lip curl slightly. He and Rodriguez had been friends since their high-school days in Texas, and he'd yet to see the other use his head while his mouth and fists were still operable. Chances were good he'd go off half-cocked this time, too, and get himself in a lot of trouble. If that happened . . . well, Perez would just have to do what he could to help. It was a pain, but Rodriguez was people, and Perez could hardly claim to be out to save the world if he weren't out to save people, too.

Lost in conversation and musings, he'd overshot his turnoff. Retracing his steps, he headed down the dimly lit lane toward his new home, hoping his roommates weren't planning to stay up late talking. As in all farming communities, Ceres's day was going to start early.

Pulling the sheet up to her chin, Carmen Olivero turned off her light with a tired sigh. *Only one day on Astra,* she thought wryly, *and already I'm a week behind. A new record.* By all rights, she knew, she ought still to be at the Unie admin complex, where the rest of the organizational staff was busy with final duty rosters and equipment/supply check-in. The latter work had been done once, of course, when the ships were being loaded, but it all had to be done over to check for breakage and such during the voyage. But Colonel Meredith had left specific orders for her group to be available at 0700, and she knew better than to scrimp on sleep if she wanted to be at least halfway competent at her job. Especially after undergoing this new space-age equivalent of jet-lag.

She closed her eyes, but her mind seemed to still be in high gear. Inventory lists and storage assignments hovered in front of her eyes, threatening her with an avalanche of paper. She'd been doing this sort of work for fifteen years now, but nothing in her experience had prepared her for the sheer complexity of this job. Ten thousand colonists and military people required a *lot* of supplies, and aside from water the local environment provided practically zilch. And it was a long, long way to Earth for anything they ran out of.

She fought it for ten minutes before finally tossing back the sheet and padding barefoot to the kitchen. The individual food supplies hadn't yet been distributed to the various houses, but the plumbing and microwave worked and she always carried a few packets of instant hot chocolate in her personal luggage. A few minutes later she was sitting by the kitchen window with the steaming mug, listening to the faint voices and machinery sounds from the direction of the docks. *I wonder when I'll start missing Fort Dix,* she wondered. Not that the base or even the rest of New Jersey had held that great an attraction for her; but after a lifetime of periodic uprootings she knew full well that the pangs of homesickness would eventually come. In her Army brat days the agony had sometimes seemed to be more than she could handle, enhanced as it was by the loss of school and friends; now, at the ripe old age of thirty-six, she knew the reaction would be no more than a dull haze over her life for a few days. Still, it was never

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much fun. *One of these days,* she told herself, sipping cautiously, *I'm going to have to give up this nonsense and settle down somewhere for good. Maybe when we've got Astra on its feet . . . or when we throw in the towel and all go home. Whichever comes first.*

Somehow, neither option seemed all that thrilling at the moment. *Never get philosophical at two in the morning,* she thought, quoting Number Twelve of her personal list of rules, and dismissed the subject. Draining her cup, she rinsed it out and put it into the sink, hoping in passing her new roommate wouldn't turn out to be a cleanliness fanatic. Back in bed, she found her brain had cut back to idle—far enough down for her usual sleep routine to be effective. Snuggling up to her pillow, she closed her eyes. *Sufficient unto the day are the troubles thereof,* she quoted to herself, and turned loose the future to handle its own affairs.

Two minutes later she was fast asleep.

Chapter 2

". . . and here are the inventory lists from Crosse," Major Thomas Brown said, laying one last thickness of printout on Colonel Meredith's desk. "Everything's out of the *Aurora* now, and the *Pathfinder*'s last load is on its way down. Most of the stuff waiting to be sorted is bulk food, clothing, and fertilizer."

Meredith nodded, glancing over the first page of the printout. His eyeballs ached their continual reminder that three hours of sleep was inadequate for a man his age. "How's the landing strip holding out?" he asked.

"Pretty well, actually. Those repulsers the Ctencri sell are pretty hot, but because the shuttles use a smaller chunk of runway for both land and lift there's actually less overall wear and tear on the permcrete. It'll need some patching, of course, but we've got three weeks before the *Celeritas* arrives on its supply run."

"Good. Do we have enough room to let the flyers lift?"

"Oh, sure. They don't need much more than their own length if you crank the repulsers up full."

"I know, but I'd rather not run them any higher than necessary. You never know what the half-life of a chunk of technology is going to be."

"The Ctencri numbers—"

"Were provided by the Ctencri equivalent of a sales rep. Need I say more?"

Brown harumphed. "Well, they should still have no trouble. It's mostly the center of the runway that's torn up, and the flyers can easily fit on either side."

"Fine." Meredith raised his wrist phone and keyed a number.

"Martello hanger. Greenburg," the device responded.

"Colonel Meredith. Have the flyers been checked out yet?"

"Two are ready to go, sir. The third'll be another hour or so."

"Okay. Have the first two teams head out—alert the tower to monitor and record all data."

"Yes, sir."

Meredith disconnected and returned his attention to Brown. "Planting get started on schedule?"

"Mostly. The fields at Crosse were still too low in zinc and manganese this

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morning, and Dr. Haversham ordered another layer of fertilizer laid down. His guess was that the rivers bordering the fields cause a faster than normal ground water exchange that siphons off the extra minerals. Or something like that."

"Great. Well, if that's the worst goof the engineers made when they laid out this place, I guess we can live with it."

"At least we've *got* the fertilizer to spare." Brown was looking curious. "You expecting to find Captain Kidd's treasure or something hidden in the hinterlands?"

"What? Oh—the flyers? No, I just thought we should do some low-level surveys of the territory around the settlement."

Brown shrugged. "We've got cartography-quality photos for about a hundred kilometers around us. What more are we likely to need?"

There was a faint whistling noise, and Meredith looked out the window in time to see the two sleek flyers shoot by and head east toward the cone of Mt. Olympus in the distance. He'd fought the budgeteers tooth and claw to get a half dozen of the Ctencri-built craft assigned to Astra, and considered himself fortunate they'd only whittled the number down to three. Though primarily for blue-sky use—their plasma jets utilized atmospheric oxygen in burning the fuel to pre-plasma temperatures—the flyers were equipped with a self-contained oxygen supply that enabled them to reach low orbit, which meant they could serve as extra shuttles in an emergency. "Suppose," he said to Brown, "there are colonies of spores or something out there, dormant now but ready to grow if and when the soil's metal content should jump—say, if one of those asteroids circling a million kilometers away comes down. Some of our fertilizer's bound to be blown off the fields, and if it starts something growing I want to have some 'before' pictures available."

Brown whistled under his breath. "I never thought about that," he admitted. "I guess that's why I'm in charge of runways and spaceports. Straightforward stuff."

"Actually, I can't take credit for the idea, either—it was the biology people who came up with it. When you think about it, the situation's analogous to desert ecology, except that here it's trace metals instead of water that's missing." Meredith paused as the faint sound of a sonic boom wafted in through the window. "Sounds like that last shuttle's coming in."

Brown hauled himself to his feet. "Yeah. I'd better take a quick look at how the unloading's going and hurry all the hovercraft back to Martello. If your terminals are on-line by the time we've got the inventory list I'll send it through; otherwise, I'll bring you a hard copy later."

"Fine. Make damn sure we've got everything before you let the *Aurora* leave."

"Right." Brown saluted and was gone.

Picking up the top printout, Meredith turned to the last page and scanned the loss/breakage list. Not too bad: a small amount of laboratory glassware broken and several bags of the metal-enriched fertilizer split. One item made him grimace—one of the broken dishes was a critical part of the apparatus for com-

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bining the fish ova and sperm they'd brought to Astra. There were spares, of course, but not enough to satisfy either Meredith or the scientists. *Idiots*, he thought harshly. *They give me a job to do, and then make sure I've got the absolute minimum I need to do it with.* Which wasn't entirely fair, he knew. President Allerton was a hundred percent solid behind the colony and always had been, but it was a handful of short-sighted Congressmen who held Astra's umbilical. They obviously considered the whole thing a UN plot to drain the United States of manpower and resources and had adjusted the colony's budget accordingly.

Laying the printout aside, Meredith picked up the next one from the pile. The months of logic, persuasion, and arm-bending were behind him now, and there was nothing more to do but get Astra running just as fast and as well as he possibly could. Uncle Sam's honor—not to mention his own chances of ever making brigadier general—were on the line here. The scoffers *would* be proved wrong.

And with that settled once again in his mind, he got to work.

It was just over an hour later when his phone buzzed with bad news. "Flyer Two has gone down, Colonel," a tense-sounding lieutenant reported. "Somewhere south-southwest of Mt. Olympus, we think."

Meredith felt a shiver go up his back. Near the volcano? He threw a quick look out the window as he headed across the room, but there was no sign of any smoke rising from the distant cone. "What happened?" he asked, throwing open the door and hand-signaling his aide to get the car.

"We're not sure, sir. We got just a fragment of something about the repulsers going crazy, and then they were cut off."

Damn unreliable alien technology. "Are any of the normal planes in service yet?"

"One of them is, sir."

"Put a medical team aboard and get it in the air. Have them pick me up east of Unie—they can land on the Unie-Crosse road. Where's Flyer One?"

"Heading toward Olympus, sir. It was over the Kaf Mountains south of here when Two went down."

"Cancel that. Have One return to base immediately."

"Yes, sir." The phone went dead for a few seconds: the lieutenant on another line. "The Cessna's being wheeled out now, Colonel. They'll be leaving in five minutes or less."

Lieutenant Andrews already had the car running as Meredith slid inside. "Good. We'll be waiting a couple hundred meters outside town. Let me know immediately if Two makes any response."

The medical team, it turned out, was unnecessary. Both of the flyer's crewmen were already dead.

Meredith walked carefully over the crash site, his stomach sore with the ache of tight muscles. The flyer had gouged a furrow perhaps a hundred meters long, scattering pieces of itself along the entire length, before coming to rest as a mangled pile of metal and plastic. The crewmen, similarly man-

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gled, were discovered still in their cockpit.

It was midafternoon before the crash specialists finished their survey and returned to Martello Base. "Near as we can tell, Colonel, all the repulsers just seemed to quit at once," the captain in charge of the team told Meredith. "We'll know more when the electronics people finish with the stuff we brought back."

Meredith nodded, gazing past the man as the Cessna was wheeled back into the hanger. He'd come here with the medical men and bodies earlier in the day, knowing he would simply be in the way at the crash site and hoping he could get some work done while the experts sifted through the rubble. The tactic had been only half successful; his mind had understandably refused to concentrate on inventories. "Any idea as to why the repulsers should do that?"

"None, sir. I'd go so far as to say it *should* be impossible. They run off three completely independent systems."

"The radar showed they were going pretty slow when it happened. If just the underside repulsers went out, would they have had time to switch to forward motion?"

"They should have—they were high enough and that maneuver's programmed into the on-board. And if they *had* tried that and simply not made it up to speed in time they would have hit a lot harder than they did." The captain shook his head.

"All right," Meredith said after a moment. "Get busy on that analysis; I'm grounding the other two flyers until you find out what went wrong."

"Yes, sir. I'm . . . sorry, Colonel."

Saluting, the captain strode off toward the hanger.

I'm sorry, too, Meredith thought as he turned and trudged toward the docks. Their first full day on Astra, and already he'd lost two men. *That's really showing the scoffers, Meredith. For an encore, maybe I could shoot myself in the foot.*

Three of the five hovercraft were bobbing gently beside the dock; Meredith passed them up in favor of a small motorboat. Casting off, he headed at half throttle toward the narrow entrance to Splayfoot Bay. By now the death certificates would be waiting on his terminal at Unie, and his stomach tightened anew at the thought of filling them out. He'd never been able to accept death stoically in his commands, not even as a line officer in the Honduras conflict where he'd faced it every other day. His years of desk riding, he was now discovering, hadn't made him any better at seeing human beings as faceless numbers. *Damn the Ctencri, anyway,* he thought, twisting the tiller hard as he steered around a half-submerged rock. *If it turns out to be a manufacturing fault I'll twist their silly crests together.*

He was just turning into the five-kilometer-long inlet leading to Unie when his phone buzzed. "Meredith," he answered.

"Colonel, this is Major Dunlop," the caller said, his voice barely audible over the engine noise. "I think we've got a riot brewing here in Ceres."

Meredith cut back the throttle. "Explain."

"About a hundred of the Hispanic field workers have gathered in front of the admin building and are yelling

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something about better housing and recreation facilities. I've got my men in riot-control position, but I haven't got nearly enough of them if things turn ugly. Can you possibly send me another thirty or so troops?"

"Have you tried talking to them?" Meredith countered.

"Sir, if I open the door they're likely to pour in before we can stop them."

Meredith grimaced, but the reply was not unexpected. Dunlop was a competent administrator, but the finer points of diplomacy and compromise were far beyond him. Spraying the crowd with stunner fire would be much more his style, and that was the last thing Meredith needed right now. "All right, then, just stay put," he told the other. "I'm a few minutes out from Unie; I'll have a team waiting and we'll drive up there as soon as I get in. Do *not* attempt riot procedures unless there is an *immediate* threat to life or safety—got that?"

"Got it, sir. I recommend you hurry with those reinforcements."

"Noted. Out."

Almost savagely, Meredith yanked the throttle back to full power. *Reinforcements, my eye*, he thought as the boat leaped forward. What Dunlop needed was a negotiating team—and that was precisely what he was going to get. Preferably one whose members spoke at least halfway fluent Spanish. *First the flyer crash, and now this. Murphy's Law is really riding high today.*

Raising his phone, he keyed for Lieutenant Andrews and began giving orders.

* * *

"Three to an apartment, we got — sometimes even *four*," Matro Rodriguez's bullfrog voice bellowed out, clearly audible even over the other shouts and the loud background muttering of the crowd. Standing to one side, Perez alternately gave his attention to the mob and to the squat adobe building they faced. The building's windows were empty of official faces, but Perez knew they were watching. Sooner or later they would decide they'd been under siege long enough and do something about it. *Idiots*, he thought, his eyes flicking back to the crowd, watching as some of the men began waving clenched fists over their heads. *All they're going to do is get the major's back up and force him to take action.* They had as yet no real economic power and certainly no political power. All they had was numbers and the threat of violence, and that only worked if those in authority were hesitant about shooting. The soldiers, Perez knew, would be under no such handicap.

The wonders of progress . . . except for those who were always one step behind.

A flicker from one of the dark windows caught Perez's eye: someone moving up to what could only be firing position. Cursing under his breath, Perez stepped forward, heading for the front of the crowd. He'd hoped Dunlop would hold off a while longer, give the mob time to blow off their steam and maybe leave peacefully. But moving troops to the windows could only mean he'd decided to have it out right now.

Nobody seemed to notice Perez as he strode to Rodriguez's side directly opposite the admin building's door; only

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a few looked quizically at him as he raised his hand for quiet. "Friends!" he called . . . but his voice didn't have anything like Rodriguez's carrying power. He was inhaling for a second try when, as if by delayed action, an expectant hush swept up the hubbub.

Turning, he found himself practically nose to nose with Major Dunlop.

The major opened his mouth to speak—but Perez had always been fast on the uptake and managed to beat Dunlop to the verbal draw. "Good afternoon, Major," he said, managing to put both respect and righteous displeasure into his voice. "We would like to have some words with you about the conditions—"

"*All right,* you lazy troublemakers," Dunlop bellowed without even looking at Perez, "you've got exactly thirty seconds to clear out of here and get back to your jobs. After that you'll wish you had. Now *move!*"

His answer was a cloudburst of angry shouts and a sudden surging forth of the mob. "Wait a minute!" Perez yelled —but his voice blended with all the others and was lost . . . and an instant later his body jerked with agony and numbness and the world tilted crazily and went dark.

Chapter 3

"Is this," Meredith asked icily, "your idea of staying put?"

Standing with the stiffness of a sentry at the admin building door, the marks of dragged bodies still visible in the dust around him, Dunlop nevertheless wasn't giving an inch. "I went out to talk as you suggested, Colonel. The mob moved forward, and my men opened fire in my defense. Frankly, sir, I don't see the problem. We only had to stun a few of them before the rest dispersed, and they'll think twice about starting trouble now."

" 'The problem,' as you call it, we'll discuss later," Meredith said, working hard to keep the fury out of his voice. He had no desire to tear Dunlop apart in front of junior officers, but that resolve was fading fast. "Now, where's this person you arrested and what makes you think he was one of the leaders?"

"His name is Cristobal Perez, one of the field workers. He was in the front of the mob and led the move forward."

"I want to talk to him."

"If you'd like—but I can tell you right now he's not very cooperative. We're holding him in one of the offices in back."

"All right." Meredith glanced once more at the scuffle-marks on the ground and gestured Andrews to his side. "I want you and the others to locate and get statements from all the soldiers who were involved in this. Make it clear we aren't out for scalps, just information. When you finish with them, look up any civilian witnesses or participants and repeat."

"Yes, sir," the aide said, nodding. "Do you want any of the Spanish-speakers to stay with you?"

"Probably should. Who's best?"

"Carmen Olivero," Andrews said, gesturing to the attractive woman standing quietly among the uniformed men. The only one among them in civilian dress . . . on a hunch, Meredith nodded.

"Miss Olivero, come with me. Let's go, Major."

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Dunlop led them inside and down a couple of corridors to a door flanked by two stunner-carrying soldiers. The guards came to attention; without bothering to knock, Dunlop opened the door and went in.

Cristobal Perez was stretched out on his back on the floor in front of the desk, a wadded-up jacket serving as makeshift pillow. About twenty-five or twenty-six, Meredith automatically estimated, his face already showing the first signs of a lifetime out under the sun. His eyes, which had been shut, opened briefly to survey the newcomers and then closed again. "I don't suppose you brought a doctor this time," he said tiredly.

"All you need is rest," Dunlop told him. "The effects'll wear off in another hour or so. On your feet now—Colonel Meredith has some questions."

"Colonel Meredith, eh?" Perez made no move to get up, but his eyes opened again, shifting from Meredith to Carmen and back. "You always let men in your command fire on unarmed civilians, Colonel?"

"Be thankful they were only using stunners," Meredith countered, watching the other's face closely. "Other mob control methods are just as uncomfortable and usually take longer to go away."

A flash of anger swept Perez's face at the word *mob;* but instead of the verbal explosion Meredith had expected, the Hispanic seemed to withdraw behind a stony mask. "You obviously haven't been shot by one of the damn things," he said, closing his eyes again.

"No. But I *have* been shot with real bullets. How about telling me what happened out there?"

"My word against Dunlop's? No, thanks —my breath's too valuable to waste just now."

Meredith pursed his lips. "If you tell the truth—"

"Look, Colonel, I was in the Army a couple of years," Perez interrupted. "I know how military people stick together. You just go ahead and figure out my sentence and we can skip the show of impartiality."

"Perez—" Dunlop began.

"No, it's all right, Major." Meredith cut his subordinate off, mentally berating his own carelessness. His deliberately tactless choice of words had forced a reaction out of Perez, all right, but driving the other into silence was an overkill he hadn't counted on. A strategic withdrawal was in order. "Perez, whenever you're ready to talk, just let me know." He opened the door and left, Dunlop and Carmen behind him.

"I told you he wasn't very cooperative," Dunlop commented as the three of them stopped a few meters down the hall.

"Uh-huh. What sort of charges have you filed against him?"

"Incitement, congregation with felony intent—a couple other minor charges. Object lesson stuff, mostly."

"I want them dropped. Miss Olivero—"

"*All* of them?" Dunlop looked nonplused.

"That's right. What's the problem? —if my investigation indicates he's guilty of something we can always charge him later. It isn't like he can skip town or something. Miss Olivero, I want you to go back in there and talk to Perez."

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Carmen turned wide eyes on him. "*Me,* Colonel? But *I* don't know anything about interrogation methods."

"I don't want you to interrogate him, just to talk with him a while," Meredith explained patiently. "Find out what exactly his complaints are, for starters. Let him know we're not out to scapegoat him or anyone else. You're a civilian; maybe he'll be more open with you."

Carmen's lip twitched, but she nodded. "All right. I'll . . . try." Stepping back to the guards, she took a deep breath, tapped once on the door, and went in.

"Keep an ear out for trouble," Dunlop advised the soldiers quietly.

"There won't be any," Meredith told him. "Let's go, Major—we have a *lot* to talk about."

Perez's first surprise was that someone was coming in so soon after the colonel's party had left; his second surprise was that the visitor bothered to knock. Prying his eyelids up against his fatigue, he watched the woman close the door behind her and stand with her back to it. For a moment there was silence as they eyed each other. "How do you feel?" she said at last.

"Tired, mainly," he answered, wondering idly about her background. From looks alone she could be fresh from Guadalajara, but her speech was definitely middle-class American. Second generation, perhaps, whose parents had become respectable before the flood of illegal refugees from the 2011 Mexican collapse had made "Hispanic" a curseword again. "Most of the pain's gone."

She nodded. "Good. Uh—my name's Carmen Olivero."

"Honored. Meredith send you in to wring a confession from me?"

Some of her nervousness seemed to vanish, to be replaced by coolness. "Hardly. The colonel has gone with Major Dunlop to get the charges against you dropped. He asked me to find out what your complaints are—assuming you want them addressed, that is, and aren't just using them as an excuse to riot."

"We *weren't rioting!*" he snapped, the outburst intensifying the pain behind his eyeballs. "We wanted to complain about the lousy conditions in Ceres and the damn soldiers fired on us." He stopped abruptly as she took a half step backwards, her hand reaching for the door knob. *Good job, Perez,* he berated himself silently. *You wanted a sympathetic ear, and now you're trying to bite it off.* "You say he's dropping the charges?" he asked in a more reasonable tone.

She regarded him uncertainly, her hand on the knob. "That's what he said."

"Very kind of him." Moved by an obscure feeling, Perez forced himself to a more dignified sitting position, sliding back so that he could lean against the wall. "I'm sorry I blew up a minute ago. I've never been wild about pain." He waved to the desk chair. "Please sit down?"

She hesitated only a second before stepping to the chair and sinking a bit tentatively into it. "So . . . what is it you don't like about this place?"

He snorted. "The list would fill a disk," he said. "As far as I'm concerned it would have made more sense to colonize the South Sahara. I've never

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understood why the UN wanted to pour so much money and effort into Astra in the first place."

"If you felt like that, why did you sign up in the first place?"

"*I* volunteered because many of my people were coming. Many of *them*, on the other hand, didn't truly volunteer."

Her eyes widened momentarily, then settled into cool disbelief. "You have any proof of this?"

He shook his head. "Nothing that would be seen as such. And don't misunderstand me: I'm not saying they were kidnapped and loaded aboard trucks for the training center. The pressure was much more subtle than that—portrayal of Astra as a new beginning, the land of opportunity and freedom that the U.S. had turned out not to be, plus the implication that life would be getting harder if not enough of us volunteered. We were painted a rosy picture—can you blame us for being unhappy with the housing and working conditions we've been put into here?"

"This is a brand-new world. Did you expect to find hotels and theaters waiting for you?"

"I expected exactly what is here—a continuation of the social injustices I was already tired of."

"Everybody's had to make sacrifices—"

"But some aren't making nearly as many as others," he shot back. "Are the scientists living three and four to a house? The soldiers? How many Anglos are going out in the fields tomorrow, planting crops by hand because the extra machinery is still packed into their crates?"

"All right, then," she said after a short silence. "Assume for the moment that you're right. What do you suggest be done?"

"For now, a sincere commitment to improve conditions in Ceres would probably be enough. We're not stupid—we know you can't build new houses overnight. If you could get us another couple of hologames for the rec center, that would be a nice gesture." Perez paused as a flicker of surprise crossed Carmen's face. *Probably expected some wildly impractical scheme for turning Ceres into Little Mexico,* he thought. *Well, enjoy it while you can, because here comes the bite.* "And I think Major Dunlop has proved he has no real feeling for the people here. He should be transferred and someone else put in charge."

Carmen's pleased/surprised expression vanished. "Oh, you think that, do you?" she asked coolly. "Do you want to suggest a replacement while you're at it?"

"Not necessarily. But why are you suddenly so hostile? I thought United States citizens had the right to choose their own leaders."

"Don't play word games," she snorted. "You know perfectly well that you gave up certain rights when you volunteered for this trip."

"Perhaps." He shrugged, locking eyes with her. "But having spent time in the Army myself, I can tell you that people grow tired of military rule very quickly. I think that Colonel Meredith would be wise to consider what he'll do when that happens."

Her face darkened still further, but before she could speak the door was opened and one of the guards peered in.

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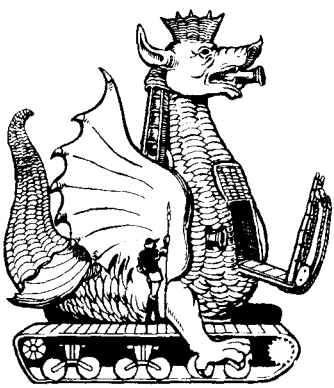

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"Olivero? Colonel Meredith's ready for you."

"All right." Carmen stood up—with more than a trace of relief, Perez thought—and went to the door. There, she paused and looked back. "I'll tell the colonel what you said. But no promises."

The door closed behind her. Wincing with the effort, Perez eased himself back to the floor. Closing his eyes, he replayed the conversation and Carmen's facial expressions as best he could. *Still on the side of the middle-class conservatives,* he decided, *but not close-minded, either. Obviously has some influence with the colonel. . . .*

He was still sorting out the possibilities when the soldiers came to turn him loose.

The drive back to Unie was long, dusty, and quiet. Meredith kept his eyes on the patch of lighted road ahead of them, his brooding silence stifling all other conversation in the car. Which was fine with him: most of the team's reports could wait until they were officially filed onto the computer, and the single exception could wait until they reached the privacy of his office.

The lights in the admin complex were still burning when Andrews pulled the car to a stop in front of it—one more reminder that there were a war's worth of details still waiting to be handled. "Your reports are due by oh-nine-hundred tomorrow," Meredith told the group as he opened his door and climbed out. "Miss Olivero, come with me; the rest of you are dismissed."

The colonel led the way down deserted hallways and into his outer office—and because it was the last thing he expected at that hour, he was three steps into the room before his eyes registered the visitor waiting there for him.

He stopped abruptly, combat senses flaring with the surprise; but the other showed no signs of hostility as he scrambled to his feet. "Colonel Meredith?" he asked, his casual stance and tone immediately tagging him a civilian.

"Yes," Meredith acknowledged. "You?"

"Dr. Peter Hafner—I'm a geologist with Dr. Patterson's group. Sorry about the hour, but your secretary said I could wait until you got in."

"No problem," Meredith assured him, making a mental note to set up new guidelines on such things. "What can I do for you?"

"Well, sir, I've been trying to arrange for a flyer and pilot to run me out to Mt. Olympus, but everyone I've talked to says the flyers have been grounded."

"You haven't heard about the crash?" Meredith asked sourly.

"Yes, sir, I have; and I'm sorry about the loss of its crew. But everything I've heard indicates the accident was a fluke, some outside influencing of the plasma itself and not an actual equipment malfunction—"

"Whoa. *What* outside influencing?"

"Maybe a rogue solar flare or something—*I* don't know. The point is it's very unlikely the other flyers would run into the same problem."

"Unlikely's not good enough." Meredith shook his head. "Until we have a better idea of what went wrong you'll just have to make do with cars or the Cessnas."

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"Neither of which will be of much use," Hafner sighed. "I understand your concern, Colonel, but please recognize I'm not talking about some abstract search for knowledge here. Astra has *got* to have some metal *some*where, and if it's not in the crust it must be deeper down. If volcanos like Olympus show any evidence at all of metal content in their rocks, it'll offer a reasonable alternative to the asteroid mining you have planned."

Meredith held up a hand. "Doctor, it's late and I've had a very hard day. If you'll file a formal request with Martello Base, you'll be put on the list for whenever the flyers are put back into service. Until then, I repeat, the cars and planes are all we have." A footstep behind him made him turn: Andrews, back from returning their car to the pool. "Now, if you'll excuse us," he added, "Lieutenant Andrews will escort you out. Good night, Doctor."

Hafner grimaced slightly, but had the sense not to argue. "Good night, Colonel. Thank you for your time."

The geologist left, followed closely by Andrews. Unlocking his office door, Meredith ushered Carmen in and waved her to a seat. "Now," he said, sinking into his desk chair, "tell me about Perez."

He listened in silence for the few minutes it took to recount her conversation with Dunlop's alleged riot leader. "He seemed pretty sincere, Colonel," she said when she had finished.

"I'm sure he did," Meredith nodded. "Whether he was or not is another story. A massive plot to press-gang Hispanics is a bit hard to swallow."

"I know." She paused. "There *do* seem to be a lot of Hispanics here, though."

Meredith shrugged. "The climate here approximates the Southwest, and we needed people experienced in farming sandy soils. That focuses on the area where Hispanics are already concentrated, so what's the big deal?"

Carmen shifted uncomfortably. "Yes, sir. But even if nothing . . . unfair . . . has occurred, there's still that perception. I was thinking on the way back . . . perhaps you could set up something like a city council in each of the towns. Not with any real power," she added quickly, correctly interpreting his expression. "It would be more of an advisory sort of body, a clearing house for complaints and suggestions."

"We already have channels like that set up," he reminded her.

"Yes, but . . ." She pursed her lips. "It's all organized along military lines. The civilians may not feel confortable with that; I know it took *me* a while to get used to military procedure and I was *raised* in an Army home."

"What you're suggesting is that I give them the illusion of democracy without the substance." Meredith shook his head. "It'd be more trouble than it's worth. You'd add top-heaviness to the administrative sector, inject a battalion-worth of unnecessary political maneuvering and infighting, and generally use up man-hours for no net gain."

"The gain would rest in smoother cooperation between civilians and military," she countered.

"Technically speaking, Miss Olivero, there *are* no civilians on Astra. Everyone is under military rule and law, and if some of them don't like it, I'm

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sorry. They'll get used to it in time." He glanced at his watch. "I'd better let you go; it's getting late. I'll want a formal report from you for the file, but there's no particular rush."

"Yes, sir." She recognized the dismissal and stood up, but then hesitated. "Colonel? What are you going to do about Major Dunlop?"

"Whatever I do, it won't be because of Perez's veiled threats," Meredith told her shortly.

She swallowed. "Yes, sir. Good night, Colonel."

"Good night."

He gazed at the closed door for several seconds after she was gone, wondering what exactly he'd done to deserve such a day. Then, with a sigh, he turned to his computer terminal and flicked it on. The screen lit up but remained blank; apparently the underground light-pipe network was still generating problems. Cursing under his breath, he turned the machine off and buzzed for Andrews.

"Yes, sir?" the aide said as he entered.

"I hate to do this to you, Lieutenant, but I've got a couple of projects I want started right away, and I'm just too dog-tired to hunt up a working terminal."

"That's all right, Colonel," Andrews said, pulling out a notebook and sitting down. "I'm fine." He looked it, too, though Meredith knew for a fact that the other hadn't had any more sleep lately than he had.

"Okay. First off, I want every scrap of information we've got on Cristobal Perez. Not just his colonist profile; check to see if any military, educational, or employment records came to Astra with us. Second, I want farm equipment assembly bumped a couple of levels up on the priority charts—and for the time being have some of the planting equipment in Crosse shifted up to Ceres. The farmers in Crosse are sitting on their hands now, anyway."

He paused. Andrews finished writing and nodded. "Anything else?"

"Yes." Meredith hesitated, then plunged ahead. "I want you to work up a list of possible replacements for C.O. at Ceres."

Andrews looked up in obvious surprise. "You're transferring Major Dunlop?"

"I don't know. I haven't yet made up my mind."

Andrews toyed with his pen. "The major's pretty popular with his men," he said obliquely. "He has a reputation for sticking up for the common soldier, making sure they get all the rights and privileges they have coming."

"I know," Meredith nodded. "But that 'us versus them' mentality is exactly what's going to lose him the support and confidence of the civilians in Ceres. We can't afford unnecessary friction."

"I understand that, Colonel. But . . . you know it's going to look like you're giving in to pressure."

"Of course it is—and I hate the signal that'll send. If Dunlop hadn't fired from the hip like he did I'd back him all the way, but as it is I either look like a coward or someone whose orders can be ignored with impunity. Either way, I give someone the wrong idea." He shrugged. "If you can come up with a better idea I'll be glad to listen."

"Yes, sir." Andrews stood up and

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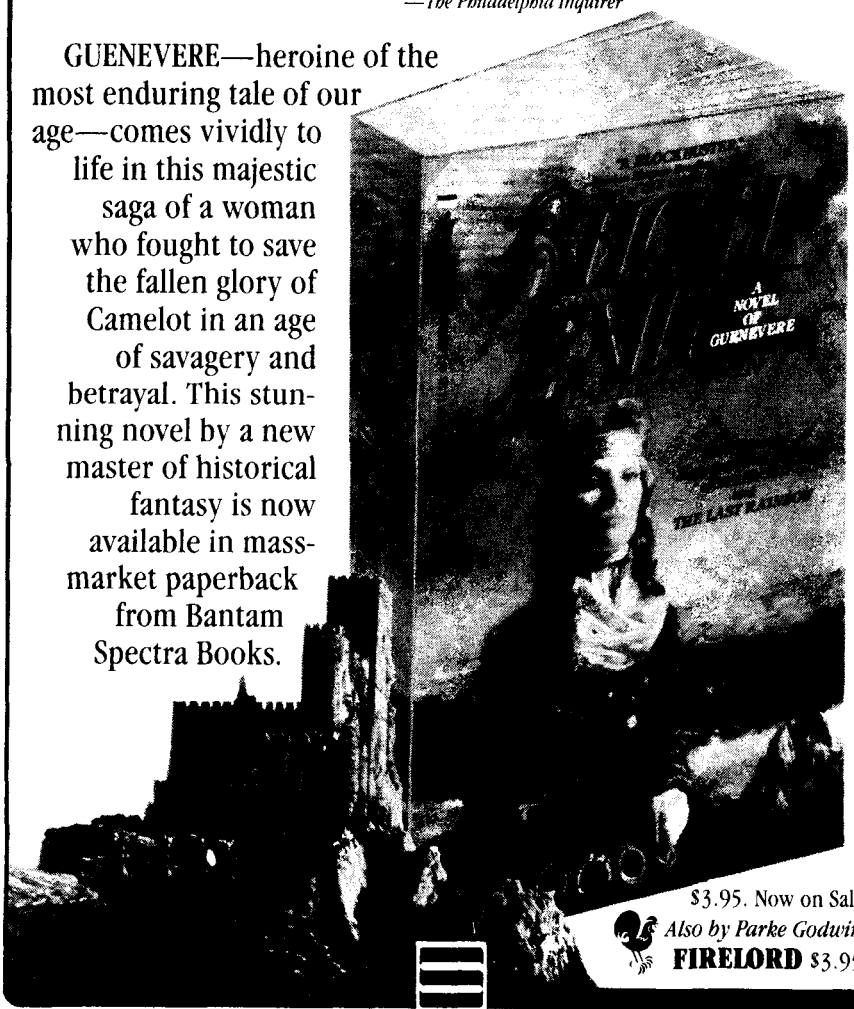

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put away his notebook, and for just a second a smile twitched at his lips. "I'll see what I can come up with in that department. In the meantime, I'll get busy on these other things."

"Appreciate it, Andrews. Good night."

It was a walk of only a couple hundred meters to his quarters, but Meredith doubted he had even the strength left for such a short trip. Fortunately, someone had had the foresight to install a cot in a back corner of his office. Flipping off the lights, he stripped to his underwear and stretched out under the light blanket. For a minute or two he watched the pattern of light and shadow on the windowshade, trying to come up with some other solution for the Dunlop/Ceres problem. But no answer came, and he quickly gave up the attempt. *Maybe in the morning,* was his final thought, *things will be clearer.*

Chapter 4

With her fifteen years of Army experience, Carmen had left Meredith's office with the depressing certainty that it would take days for the colonel to take any action on the problems she had discussed with him—and that it would be *weeks* before she saw any of the results. It was therefore a pleasant shock when she arrived at her desk the next morning and found the shifting of extra farm machinery to Ceres already underway. A fast scan of the priority listing showed none of her co-workers had yet taken the job of organizing the assembly of spare farm equipment; keying that job onto her terminal, she set to work.

It was routine data manipulation—a simple matter of locating the equipment and necessary tools from the computer's listings and then shuffling work schedules for the right number of qualified mechanics—and as she tapped keys her mind drifted back to the previous day and her conversations with Perez and Meredith.

She hadn't worked under Meredith for long, and aside from a brief interview when she'd been accepted for the colony her personal knowledge of him was limited to the Ceres trip. Still, military bases had their fair share of gossip, and the stories she'd heard about the colonel had invariably painted him as honest and fair, which made his quick dismissal of Perez's allegations seem out of character. True, he was under a lot of pressure—and, admittedly, *she* wasn't convinced Perez had a case, either—but it still seemed like an investigation was in order. As for Dunlop's dismissal, she couldn't make up her mind which way she hoped Meredith would decide.

In one corner of the terminal screen a yellow light blinked on. Startled, Carmen looked at what she'd just typed, realized with mild annoyance that in her reverie she'd tried to shift a worker who was already on a higher priority job. She blanked the command, the yellow light disappearing as she did so. Keying for the next page, she resumed scanning the job assignments.

One thing she *was* sure of, though, was that part of her responsibility to Astra was to do her bit to lower tensions and friction . . . and to that end she was determined to push her town council idea as hard as she could. Meredith's scorn notwithstanding, it seemed to her the simplest way to make the civilians

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feel more at home. Besides which, if the colony survived it would eventually shift to civilian government anyway, and having such a setup already in place would undoubtedly ease the transition.

Without warning, a red-bordered rectangle appeared in the middle of her screen, the words TOP PRIORITY MESSAGE flashing above it. Frowning, Carmen watched as words began filling the box . . . and felt her eyebrows climbing her forehead as she read them.

ATTENTION: ALL PERSONNEL: SATELLITE ARRAY HAS DETECTED ROOSHRIKE SPACECRAFT APPROACHING ASTRA. NO HOSTILITIES—REPEAT, NO HOSTILITIES—ARE EXPECTED, BUT ALL MILITARY PERSONNEL ARE TO REMAIN ALERT. LEGAL/ORGANIZATIONAL STAFF WILL IMMEDIATELY PREPARE LISTING OF KNOWN ROOSHRIKE CUSTOMS AND RITUALS FOR TRANSMISSION TO COLONEL MEREDITH'S OFFICE.

Carmen read the message twice before blanking it from her screen. "Hell in a Stealth," someone behind her muttered. The astonished chatter was just starting when Carmen's superior cut it off.

"All right, all right; delete the noise," she growled from her own terminal. "Smith, Hanson—start a Legal File search; Barratino, you check military records; Eldridge, start a general search for anything that's gotten buried in odd corners. Olivero, you organize and format everything as it comes in."

The room fell silent, except for the steady sleet-on-a-window sound of computer keys. *What rotten luck*, Carmen thought as she waited for the data flow to begin. *Stuck in a little room twenty kilometers from the landing field when I could be out there catching my first glimpse of a real live alien.*

Though come to think of it, perhaps it wasn't such bad luck, after all. The Rooshrike *had* contacted humans once before . . . and *that* time they'd opened fire.

The Rooshrike attack on the *Celeritas* was also on Meredith's mind as he watched the shiny dot driving over the ocean toward Martello Base, the feeling of being a massive sitting duck adding stiffness to his back as he sat in the lead vehicle of the five-car welcoming committee. The chances that this was a sneak attack were small—after all, over half of Astra's rental fee had yet to be paid—but business logic had only minimal effect on Meredith's combat reflexes. Trying to pretend that the sweat collecting on his forehead was due solely to the warm day, he squinted into the bright blue of the sky and waited.

Radar had already shown that the ship was considerably larger than the shuttles Martello's landing strip had been designed for, but the Rooshrike pilot had assured Meredith that that wouldn't be a problem; as the arrowhead-shaped craft made its final descent the colonel saw why. Unlike the largely horizontal approach used by American shuttles, the Rooshrike's was predominantly vertical, reminding Meredith momentarily of the old single-use space capsules. He winced, recalling the helplessness of those ancient craft; but at nearly the same instant the image vanished as white spears of repulser fire erupted from beneath the ship. Even at their supposedly safe distance Meredith distinctly felt the heat wave of that ignition,

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and with a silent prayer for the runway's permcrete he watched the alien touch down. A minute later, he ordered the motorcade forward.

The Rooshrike ship had deployed a debarkation ramp by the time the humans reached the area. The ramp, designed to bypass the hottest sections of permcrete, was considerably shorter than the ones the Ctencri who'd landed on Earth had used, and Meredith decided the description of the Rooshrike as hot-planet aliens hadn't been overstating the case.

The Rooshrike itself, when it appeared, wasn't particularly impressive; but then, as Lieutenant Andrews would comment later, there wasn't a lot even aliens could do with basic spacesuit design. Apart from the oddly-shaped face just barely visible through the dark visor, the creature descending the ramp might almost have been a slightly misproportioned human.

It came alone. Taking the cue, Meredith left the cars and went forward, moving as close to the ramp as he could stand. The alien reached the end of the ramp and stopped expectantly.

Meredith cleared his throat. "I greet you," he called to the alien, "and welcome you to Astra. I am Colonel Lloyd Meredith; I speak for my people."

There was a barely discernable pause as the Rooshrike's translator caught up, and then the alien stepped off the ramp and started forward. Meredith started breathing again; apparently he'd gotten the formal greeting right.

Or else the Rooshrike was being tolerant with the new race.

The alien stopped a couple of meters in front of Meredith. "I greet you in turn," it said, its voice hitting the same slight mispronounciations Meredith had heard from the Ctencri translator computers on Earth. "I am Beaeki; I speak for my people."

"We're pleased to have you here," Meredith told him, easing back a few centimeters. The alien's spacesuit was noticeably hot; Meredith wondered what the internal temperature was. "I regret we cannot offer proper accommodations for your stay, but our information concerning your environmental needs is incomplete."

"I will not require accommodations; my visit will be brief. And your lack of complete information is per our instructions to the Ctencri."

Not much for the odd polite lie, Meredith thought. *That'll be a welcome change.* "I see. Would you care to explain why? After all, we're neighbors now, and either of us might someday crash a ship in the other's territory."

"Your argument is unidirectional. Should a Rooshrike ship be distressed in this sytem a rescue team from the inner planet would provide aid."

"You have a colony in this system?" Meredith asked carefully. The Ctencri hadn't mentioned *that.*

"A mining base only; the surface is too dry for practical colonization. The base is adequately defended against attack, however."

Meredith let the implication pass without comment; a stiff denial that Astra had any militaristic intentions might be misconstrued. "I see. May I ask how long you intend to stay here? I would like to give you a tour of our colony and the facilities we are setting up to mine the mineral deposits near

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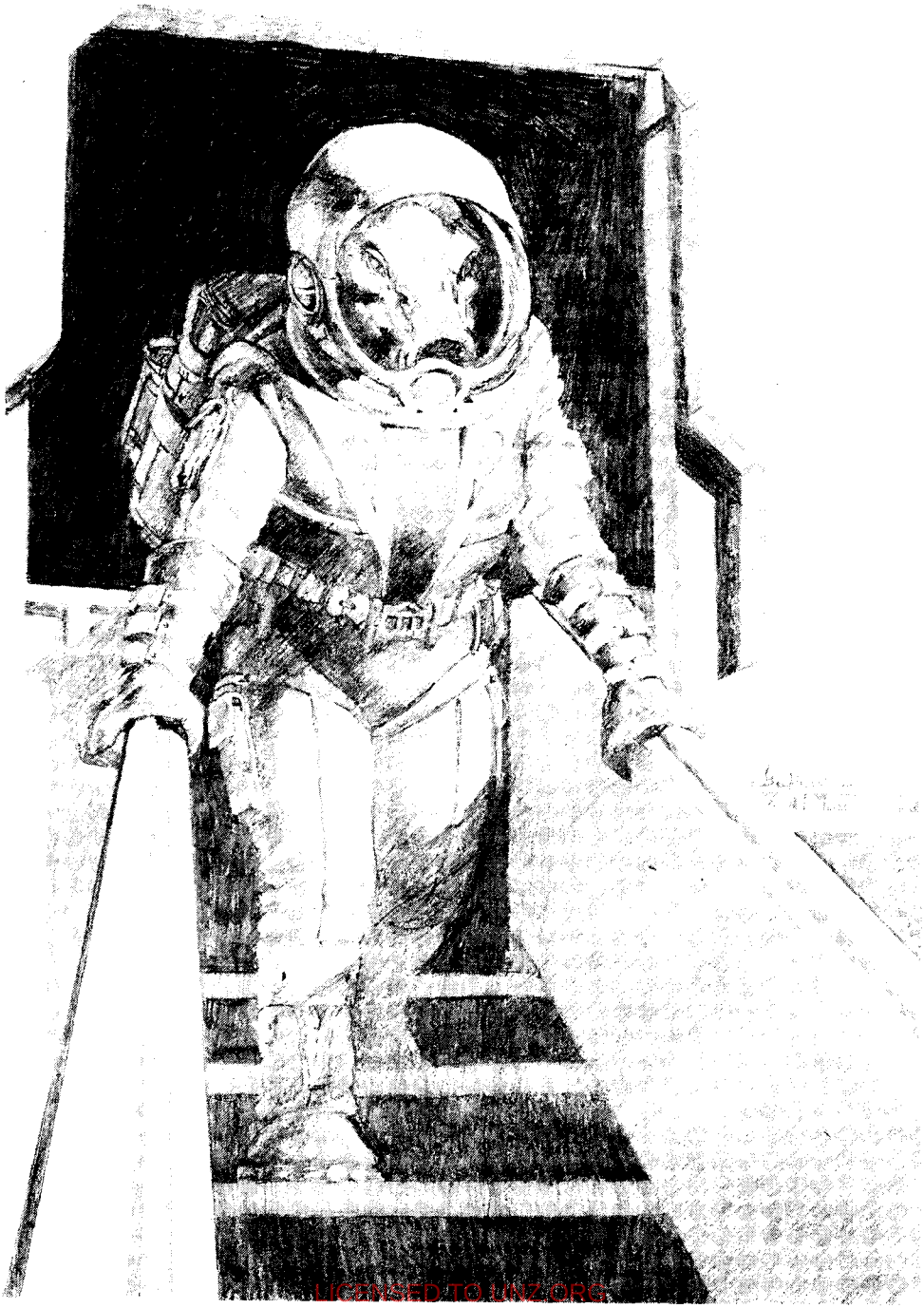

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here." A sudden thought struck him. "I take it you referred to liquid sulfur when you spoke of your mining base being too dry. Our analysis indicates that sulfur is the third most common element in our soil. Perhaps when we get our mining and separating equipment going you'd be interested in purchasing some of the sulfur from us."

There was a long pause—so long, in fact, that Meredith wondered if the translator had hit a snag somewhere. He was trying to come up with a complete rephrasing when Beaeki spoke. "Forgive our breach of understanding," he said, slipping his hands momentarily behind his back. "I am named Beaeki nul Dies na. We did not realize you were of equal status with your home planet. We assumed you were a vassal world, or possibly a detention center. We apologize."

"It's all right," Meredith assured him. *Now what brought* that *on?* he wondered. *The business about selling them sulfur?* He wished desperately that the Ctencri had given them a little more data on Rooshrike psychology. "Human political and organizational structures can be pretty hard for even humans to understand, let alone outsiders. I take it the Ctencri didn't tell you very much about us?"

"The Ctencri do not give information away free. We ascertained you would be no military threat to us, even if you were outcasts, but could afford no more."

"Mm. The Ctencri charge too much, you think?"

"The Ctencri are usurers," the Rooshrike said flatly. "They perhaps appear generous to you at this time because you are newly contacted and they do not yet know what they want from you. But you *will* learn, as we did, that their only interests are building their own power and influence."

"Well, we have a long history of that ourselves. Once we find our feet the Ctencri may find us harder to fleece than they expect." Meredith suddenly remembered his duties as host, and gestured back toward the cars. "May I offer you that look around now? I'm sure the Ctencri didn't tell you what we had planned for Astra—and we don't charge for the tour."

"I will accept." If Beaeki had caught the attempt at humor he gave no sign of it. "I would prefer we use my vehicle, though. If you have no objection."

Meredith shrugged, trying hard not to read anything sinister into the suggestion. "No objections at all. Whenever you're ready."

It took only a few minutes to offload the vehicle, a sort of cross between a hovercraft and a powerboat with stubby outriggers; but once he and Beaeki were inside Meredith understood the alien's reluctance to rough it in Astra's more primitive cars. The passenger compartment was large, comfortable, and whisper-quiet, with a climate control Beaeki thoughtfully set to match the outside air temperature. The ground effect cushion, which seemed both more powerful and less dust-making than those of the military ground-effect vehicles Meredith was used to, handled even boulder-sized obstacles with ease. Meredith's escort, confined as they were to cars and the water-only hovercraft, had a hard time keeping up, but Meredith wasn't overly

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concerned. Beaeki didn't seem bothered by the possible breach of protocol, and as their conversation was being monitored via Meredith's phone the colonel didn't feel nervous when out of sight of his men.

What he *did* feel was surprise. Beaeki, he'd judged, was only mildly interested in what the humans were building on Astra, and he'd accordingly been thinking along the lines of a half-hour trip to Unie and back. But the Rooshrike, with no trace of his earlier official coolness, asked question after question, and before he knew it Meredith had launched them on a grand tour.

They began at the continental shelf due east of Martello Island, where the mysterious mineral deposits lay clearly visible a few meters beneath the water. Crossing the narrow strip of land that separated the ocean from the northernmost finger of Splayfoot Bay, they came to the village of Wright, where the mined minerals would eventually be separated and purified. The road from there to Unie bordered both the bay and the Wright-Unie farming area, and Meredith spent several minutes talking about the special fertilization being used. He broke off the monologue when Beaeki explained his race had little interest in plant cultivation; on Rooshrike worlds, with solar energy up to thirty times more abundant than on Earth, keeping the flora cut back was more of a problem than persuading it to grow. The fish nurseries near Unie were far more to his interest, inducing him even to stop the vehicle and get out. Squatting by the offshore mesh pens, whose tops barely cleared the surface of the water, he peered into the depths as Meredith de-

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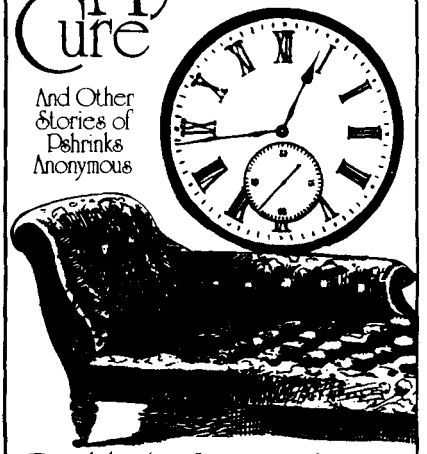

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scribed how the metal-rich runoff from the Crosse fields would be carried by the river to the bay, where it would presumably allow the growth of algae and more complex plants to which the penned fish would have access.

"You go to great lengths for such a useless world," Beaeki commented as they headed toward Ceres.

"It may be the only other one we ever have," Meredith said sourly, "if the Ctencri are to be believed. Besides, we humans are very big on challenges."

They made a fast circuit of Ceres —where, thankfully, the workers were sticking to business today—looked at Teardrop Lake, and then headed south to Crosse, at the junction of whose rivers a second fish nursery was located.

And through it all, Meredith learned a great deal about the Rooshrike.

They were a young race, relatively speaking, technologically anywhere from eighty to three hundred years behind the other starfaring races of the region. As junior members of the six-nation trading association, they had chafed somewhat under the perceived condescension of the older races, particularly that of the Ctencri, and while they had rapidly built an empire of twenty colonies and bases they had always had the feeling none of the others really took them seriously. Though Beaeki never actually said so, Meredith got the distinct impression the Rooshrike were relieved that the beings from Earth were taking their former place at the bottom of the pecking order.

"Nice that at least no one's all *that* much more advanced technologically than all the others." Meredith put in at one point. "Still seems sort of odd, though, considering all the time that's been available for life to develop in."

"An accident of nature," Beaeki said, gazing out the side window as he drove. "Approximately one hundred forty million years ago a supernova saturated this part of space with enhanced cosmic radiation, resulting in rapid mutation of disease organisms, destruction of high-atmosphere protective regions, and direct large-creature destruction via tissue damage. Those peoples capable of survival lost nearly all technology; the few who survived are more primitive now than even your people."

"I would have thought some of their knowledge would have survived with them."

"But the material base did not. Too much of their metal was already in forms too difficult for a primitive technology to extract."

Meredith swallowed. Metal again; metal, and lack of same. Just what his low-flying morale needed to hear about.

"Other more advanced races are reputed to exist," Beaeki continued. "But they are far away and few have seen them. They show as little interest in us as we do in the non-space-going peoples within this region."

"Um." *Probably*, Meredith thought, *just as well.*

He probed for information about the other nearby races, too, but here he had somewhat less success. Whether Beaeki simply wasn't interested in talking about their trading partners or whether the Rooshrike had learned the folly of giving away useful information for free Meredith didn't know. Still, he managed to get the races' names and general locations and, in a couple of instances,

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a brief physical description. Of those, the most interesting was that of the Poms, sea-going creatures that sounded something like dolphins equipped with manipulative tentacles. Meredith had often heard that a mechanical culture was impossible without fire, but Beaeki wouldn't say what the Poms had discovered as a substitute.

"That's something else that seems odd about this whole setup," Meredith commented. The tour over, Beaeki had brought his vehicle back to the ship and set it down expertly beneath its davits. "You said the edge of the Poms' territory is only a couple of light-years away. Since you're only interested in hot, Mercury-type worlds and the Poms live in liquid water, why haven't your two empires interpenetrated? Surely each of you has planets the other could use; it seems a perfectly reasonable deal for both sides."

"You will learn that there are only two things of value in an interstellar community: information and resources," Beaeki said as they left the vehicle and walked around to the ship's entry ramp. "All the solid bodies in a nation's territory, whether useful for colonization or not, can be exploited for mineral wealth and are thus guarded carefully."

"I would think asteroid mining would be cheaper than hauling cargo out of a planet's gravity well, though," Meredith suggested.

"Certainly. But asteroid belts are rare."

"Oh." A stray fact clicked in Meredith's mind: the Ctencri mission to Earth had rather off-handedly brought up the subject of mining rights. He

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would have to send back a warning with the next ship to watch out for a possible swindle. "As I recall, our lease includes the rights to this system's asteroids."

"Correct. But you may be disappointed. The belt is curiously deficient in the high-density, heavy-metal asteroids that are most profitable for mining."

Meredith grimaced. How much of the eighty million dollars, he wondered, had gone for those mining rights? "You people seem to have learned the principles of cutthroat business without much trouble."

"The Ctencri are good teachers, but their lessons have been expensive."

"Thanks for the warning. We humans are supposed to be pretty good businessmen ourselves."

"Perhaps." Beaeki paused at the edge of the ramp and made a sweeping gesture across the torso of his spacesuit. "If you would be interested in buying metal from us, our refinery here may be able to supply small amounts."

"We would certainly be interested in discussing the matter," Meredith said nodding. "And *you* should consider buying the sulphur and other minerals we will soon be producing."

"I will pass your offer to the proper reviewers. Farewell."

Turning, the Rooshrike walked up the ramp and disappeared back into his ship. Meredith's escort, which had parked a respectful fifty meters back, drove forward to pick him up, and within half a minute they were speeding toward the control tower and the safety of distance. They needn't have worried; Beaeki waited until they were well clear before withdrawing the ramp and starting the plasma compression cycle.

The launch, a few minutes later, was more spectacular than even the landing had been. The ship drifted almost leisurely upward at first, its repulsers muted in obvious consideration for the permcrete, but at a hundred meters the white spears abruptly became a pillar of fire, and the ship shot up like a fly off a table. Five seconds later the drive repulsers added forward motion; a minute after that it was lost to sight past the hazy cone of Mt. Olympus to the east.

Seated next to Meredith in the car, Lieutenant Andrews let out a low whistle. "Either the Rooshrike have one hell of a technology," he commented, "or else the repulsers the Ctencri sold us are about five generations behind state of the art."

"Probably both." Meredith felt drained, as if he'd just spent the morning before a hostile Congressional committee. "Well, I guess that's our taste of diplomacy for the week. Let's get back to work, shall we?"

Chapter 5

Beaeki's departure coincided with the beginning of over a week of relative quiet on Astra, a breather that finally allowed Meredith to get the colony back on some sort of schedule. Whether it was the small concessions he'd thrown to the militants in Ceres or whether the adjustment to Astra's twenty-seven-hour day had simply worn everyone out he didn't know. Whatever the reason, though, he was grateful.

News from other fronts was somewhat less encouraging. The fields at Crosse had finally been enriched enough

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for planting to begin, but they were still losing metals too fast. Proposals for countermeasures began to clog Meredith's desk, and he had to pull two of Major Brown's engineers off construction work to do cost/practicality studies on all of them. The offshore mining had begun, but it was quickly becoming evident that unless the Rooshrike could be induced to buy some of the final products, the whole scheme was going to be a gigantic waste of money. Given the lackluster support the UN was giving the colony already, a failure of its one potential money-making project might induce them simply to throw in the towel. To Meredith that would be nearly equivalent to losing a war, a scenario of national dishonor that he had no desire to preside over. But if there were any other way for the colony to help support itself, neither he nor any of the scientists he'd put the problem to had been able to find it.

The only real bright spot amidst the gloom was that by the end of the week the two remaining flyers were back in the air again. The techs at Martello had finally concluded that Hafner's earlier guess was correct, that some outside electric field in exact resonance with the repulser confinement fields had allowed the plasma to leak out. *Where* such a field could possibly have come from was a question no one could answer; but as the flyers continued to crisscross the area without the slightest hint of trouble, even Meredith was finally able to hear their characteristic whistle overhead without wincing.

And on the tenth day the quiet was shattered.

* * *

"Now you listen to me, Major: you will *stay put*. Is that clear? No sweeps, no stunner spray; *nothing*."

Sitting in Meredith's office, Carmen waited for the colonel to finish his conversation, her fury at Cristobal Perez a churning knot in her stomach. *Yes*, the colonel's phone had an unlisted number, and *yes*, her office was just down the hall from his—but Perez still should have called the listed duty officer number instead of putting her in the middle of something that wasn't any of her business.

"Not unless they start breaking more than windows," Meredith growled into his phone. "Just go back to observing and keep me informed, okay? . . . Right; out." Muttering a curse, the colonel flipped off his phone. "Idiot," he growled, shaking his head. "The planet's practically *made* of silicon and he's worried about a few windows." Looking back at Carmen he almost visibly shifted gears. "Right, now. You were saying you had a message from Perez?"

"Yes, Colonel." Gritting her teeth, she plunged in. "Mr. Perez called me a few minutes ago with a couple of suggestions—"

"You mean demands, don't you?" Meredith interrupted.

"I don't know, sir. They *did* sound more like suggestions to me."

Meredith dismissed the point with a grunt. "All right. Let's hear them and be done with it."

"First of all, he again says that Major Dunlop should be relieved of command in Ceres." The list was short, and Carmen ran through it as quickly and precisely as she could. When she was finished Meredith grunted again.

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"As it happens, I'm still considering what to do with Major Dunlop," he said. "Relieving him of command is one possibility, but I'm not going to be rushed in my decision—certainly not by some transplanted professional troublemaker."

Carmen frowned. "Sir?"

"Oh, you didn't know? Your friend Perez was what the media blithely calls a Hispanic Rights activist back in Arizona. Sort of a newcomer to the field, but damn good at it—has one of those golden oratory styles that charms the stuffing out of crowds and liberal media. I don't know who the iron-head was who approved him for Astra, but I intend to get him *dis*approved and sent back as soon as I can."

"I see." Perez's presence here was starting to make sense—perhaps on more than one level. "Colonel . . . have you given any more thought to the idea of setting up a citizen advisory council? I think it might ease the tension if you announced—"

"Miss Olivero." Meredith's voice was soft and excruciatingly patient. "The farm work in Crosse is three days behind schedule, work on Martello's landing field is being interrupted while Major Brown tries to figure out whether we should be building defenses against that Rooshrike mining group two planets over, and about thirty of my troops are currently tied up with civil peacekeeping duty. I'll tell you just once more: *we cannot spare the man-hours a farce like that would cost.* Is that clear?"

"Yes, sir," she said between rigid lips.

"Good. You can tell Perez you delivered his message—and the next time he has something to say, he can write me a note. Dismissed."

Silently, Carmen got to her feet and left the room, resisting the urge to slam the door behind her. Of *course* an advisory council would use up time—but so did civil unrest. In the long run the good such councils did nearly always outweighed their costs; she'd seen the studies that proved it. Why wouldn't the colonel at least give the idea a fair hearing? Was he simply allergic to civilian politics, like so many other career officers she'd known? Or—

Or was it because she was a Hispanic?

"Excuse me, miss?"

She came to an abrupt halt and focused for the first time on the man who had stepped between her and the outer office door. "Yes, ah—?" she said, trying to figure out where she'd seen him before.

"I'm Dr. Peter Hafner," he identified himself. "Geologist. I saw you with Colonel Meredith the second night here, when I came to ask about the grounded flyers."

The memory clicked. "Yes, of course. You wanted to study Mt. Olympus."

"Right. Well, I've been trying to see the colonel about getting one of them—they're back in service, but I'm way down on the list."

Carmen shot a glance at Meredith's secretary, caught the other's look of strained patience. She'd once worked as a secretary herself. . . . "Tell you what," she said to Hafner. "Let's go to the lounge and you can tell me why a car or plane won't do. Maybe we can work out something."

"Well . . ." Hafner's eyes flicked behind her to Meredith's door. "Okay."

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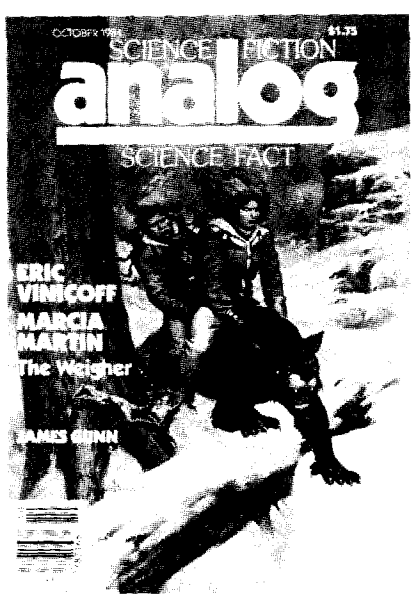

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He didn't wait for them to reach the lounge, but launched into his spiel before they were even out the door. "Let me remind you first of all why an examination of Olympus is so important. For whatever mysterious reason, there appears to be little or no metal content anywhere in the first five hundred meters of Astra's crust, if the Rooshrike data can be trusted. A volcano like Olympus gives us a sampling of the deeper magma—and if that layer should turn out to be metal-rich, it would give us an indication of where the weak points are for drilling."

He paused for breath, enabling Carmen to get a word in. "Yes, I remember all this from the last time. You haven't said yet why you specifically need a flyer."

"A car doesn't have the room I'd need to carry a coring tube and driver —the tube breaks down into sections, but they're almost five meters long. I don't know if a Cessna can carry them, but even if it can I wouldn't be able to land as far up the volcano cone as I'd need to. I need VTOL, and that means a flyer."

They'd reached the lounge now, little more really than a widening of the hall with a few chairs and low tables. Three junior officers sat around one of the tables, deep in conversation; Carmen steered Hafner to the table farthest from them and sat down. The geologist took a seat opposite her, an expectant look on his face. "First of all," she told him, "I'm not really in a position to do much about this. I'm technically a civilian, and don't fit anywhere into the chain of command."

He waved the disclaimer away. "You clearly have the colonel's ear, though. That's more important to me now than any silly ranking scheme."

First Perez. Carmen thought, *and now him. What on Earth am I doing that makes me look so authoritative?*

"Besides," Hafner continued, "civilians like you I can talk to. I sometimes think military procedure was set up specifically to confuse and intimidate those of us outside the secret club."

Somewhere in the back of Carmen's mind a light flashed on. "You're having trouble adjusting to Army rules?" she asked casually.

Hafner let his breath out in a *whuff*. "I've had less trouble with the LA city government. That's why I've been haunting Colonel Meredith's office, in fact—I can't seem to find the right way to go through channels properly."

"I know how you feel." She nodded. "It took me the better part of six months to figure my own way around." She paused. "As a matter of fact, that whole problem's been on my mind lately. What would you think of us organizing a sort of citizen's advisory council to act as—oh, complaint clearing house and general go-between with the military?"

"Sounds great," Hafner said. He cocked his head slightly. "Though . . . that 'us' wasn't specifically you and me, was it?"

She laughed. "No, I'm not roping you in as co-chair or anything. Actually, I'm afraid the colonel hasn't gone for the idea yet; he thinks it would take up valuable man-hours."

Hafner grunted. "If it simplified communication it would pay for itself in the long run." He leaned back

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slightly, a knowing smile playing at the corners of his mouth. "So. I gather you want me to make the same suggestion to him, using my scientific authority or whatever?"

"More or less." She found herself mildly impressed that he'd caught on so fast. "You don't need to fake an independent brainstorm, though. All I want is for you to get as many of the other scientists and technical people as you can to support the idea. You're the real VIPs here, and the colonel knows it."

"And once you've got his permission to go ahead?"

She hesitated only a second. "When the colonel authorizes the council, I'll get you one of the flyers."

"It's a deal," Hafner said promptly, getting to his feet. "If you'll excuse me, then, I'll go find myself a soapbox and get busy." Whistling something '90s-sounding, he disappeared down the hall.

Carmen stayed where she was for another minute before starting back toward her office. What Meredith would think of all this she couldn't guess, but with any sort of backing from the scientific community he should find it impossible to refuse at least a trial run. And once set up, the council *would* be worthwhile—she knew it.

And then life on Astra might settle down a bit . . . and she would have to finagle a flyer for Hafner. But that was all right; she'd manage it.

Somehow.

Chapter 6

". . . and the elections will be exactly two weeks from today, terms to be six months each." Meredith glared over the top of the computer screen, and Carmen felt the room chill down a degree or two. "Will that be satisfactory?"

"Yes, sir," she said promptly. A longer pre-election period would have been nice, but as long as the council was strictly advisory it didn't much matter whether or not the best people got on it. "Thank you for giving this a chance, sir. I know you won't be sorry."

Meredith leaned back in his chair and gave her a long, measuring look. "It's a pity you never actually joined the service, Olivero. You have the type of self-confidence that makes for the kind of officer C.O.'s either love or can't wait to transfer."

Carmen swallowed and said nothing.

"But I like to think of myself as open minded," Meredith continued. He reached forward and typed for a moment on his terminal. "So I'm going to give that optimism a real test. As of right now, *you* are in complete charge of this council: its organization, election, procedures—everything. Your file lists an impressive para-legal background, so this should be right up your alley. It'll all be done in your off-duty time, of course."

Carmen stiffened, but she knew she should have expected something like this. She'd backed the colonel into a corner and he was getting his revenge. "I understand, sir," she said.

"Good. Now, since your organizational department conveniently keeps track of Astra's progress versus the original projected schedule, we know that—after two weeks—we're about five days behind, overall. If we ever

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drop to *ten* days behind, your council will be summarily disbanded—no arguments or appeals. If, on the other hand, we ever get *ahead* of schedule, you can come to me and we'll discuss whether to relieve you of the extra council duty or else cut back your official work load. Fair enough?"

"Very fair, Colonel," she said, both surprised and pleased. He *was* being reasonable about this, after all. "Thank you, sir."

His mouth quirked in a wry smile. "Just remember this warm glow when you're trying to function on four hours of sleep a night. Dismissed."

Not surprisingly, Dr. Hafner was waiting for her in the outer office. "Well?" he asked, getting to his feet.

"All set," she said. "He took the package pretty much as I'd presented it."

"Great." Hafner opened the door and they walked together into the hall. "So . . . when do I get my flyer?"

"How are you on early mornings and long days?"

"Haven't had anything else in years."

"Okay. Have all your stuff out at Martello Base by 0400 tomorrow. Can the two of us load it by ourselves?"

"We can if we've got access to a forklift." He gave her a quizzical look. "You're coming too?"

"I pretty well have to, since I'll be flying the thing."

Hafner stopped short. "*You?*"

"Sure. The Army gave a bunch of us a crash training course right after the *Celeritas* got shot at and they thought we might be heading into a war. I'm not very experienced, but I *am* qualified, and flyers are actually simpler to handle than normal aircraft. More automatic systems, for one thing."

"I've heard that." Hafner still looked unhappy. "Uh . . . look, I don't doubt that you're capable—"

"And if we *don't* do it this way, you'll just have to wait your normal turn," Carmen put in calmly, "because I can't shift around both a flyer *and* a regular pilot without flashing red lights all over my boss's board."

Hafner considered for a second, gave in with a wry smile. "Well, since you put it that way, I accept. See you at four."

The notice, stuck prominently to the Ceres bulletin board, was surprising in and of itself; but to Perez, its co-authorizing signature was even more unexpected. So Carmen Olivero *had* gone and gotten herself involved. He'd hoped his nudges would do some good, but he hadn't expected anything this fast. *You see, Carmen?* he silently addressed her signature. *Underneath all that cultural armor you're just like the rest of us. Hispanic blood does not thin with distance.*

He read the notice again, more carefully this time. Meredith, at least, was sticking to expected form. The council was clearly being designed as a cardboard cutout, with a slightly louder voice but no more power than any ten citizens had right now. But that was all right . . . because eventually it would change.

Turning, Perez strolled toward the rec center, where other workers would be gathering after a long day in the fields. Ceres's fifteen hundred civilians would have two representatives on the new

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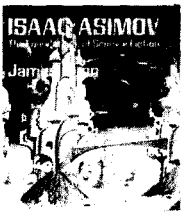

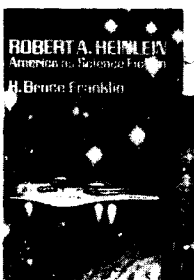

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council . . . and one of those, Perez had decided, would be he.

Chapter 7

Astra's sun was peeking over the eastern horizon as Carmen eased open the throttle to send the flyer drifting smoothly into the air. Hafner kept his eyes on the handful of displays and meters as she shifted from vertical to horizontal flight, but if the maneuver was in any way a tricky one, it wasn't apparent. On the contrary: the more he watched, the more it seemed that a bare handful of the dozens of controls were all she needed to guide the craft. He wondered what the others did, but their glowing labels were more confusing than informative. Eventually, he broke down and asked her.

"Most of those are used only when the flyer is in its spacecraft mode," Carmen told him, raising her voice over the low rumble of the repulsers.

"Ah." At least they wouldn't be needing *that* capability today, Hafner thought.

"Have you decided yet where you'll want me to land?" Carmen asked.

"If we have the time, perhaps we can circle the cone first. I need to find a good area to sample."

She nodded and for a few minutes neither of them spoke. Looking out his window, Hafner let his eyes drift over the landscape. Just south of their path, Unie was a collection of tannish blocks set on slightly darker tannish ground. Much farther to the south the white-edged peaks of the Kaf Mountain range provided only a slight contrast of coloration; and most of *that*, he knew, was due to shadows and other basically optical effects. No ferric red, no cupric green—the whole territory had all the washed-out blandness of a Hawaiian hotel beach. His eyes drifted ahead to Crosse . . . and narrowed a bit. "Carmen," he called, "can you slow down just this side of Crosse?"

She glanced curiously at him. "Sure. Anything wrong?"

"I think I can see the outline of a shallow circular depression between the river and the Unie-Crosse road. I want a better look at it."

"What is it, a dead volcano or something?" Carmen asked, shifting the flyer's course toward the area he'd indicated.

"More likely an old meteor crater," he said, peering down. "A little higher, please . . . yes . . . yes, damn it. That's what it is, all right. Too circular to be anything else. Thanks; we can go now."

The flyer tilted slightly to her side and he saw her take a quick look for herself before resuming their horizontal flight. "You sound annoyed," she ventured. "Are you worried about meteors hitting us?"

"Yes, but not the way you're thinking." He waved toward her window. "Teardrop Lake over by Ceres. If you look at it on satellite photos you can see that it's a circular depression that's been eroded by the rivers entering and leaving. The Dead Sea southeast of Olympus is the same thing plus what appear to be fault-line appendages. Even Splayfoot Bay shows a deep area in the center that's basically circular. This planet has been literally *pelted* with rocks over maybe the last half million years—not surprising when you consider how close we are to the asteroid belt here. *So*

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where's all the metal those meteorites brought down with them?''

Watching her, he noted with approval the furrowing of her forehead. At least she recognized the paradox there; some he'd talked to hadn't even made it that far. ''Well . . . could the Rooshrike survey data be wrong?''

''That's the most likely explanation,'' Hafner nodded. ''The problem is that we've done our own spot checks since then. Our equipment doesn't have their half-kilometer range, but the chunk of rock that dug out Splayfoot Bay ought to have left *some* of itself scattered through the topsoil.''

''Then maybe the asteroids that hit were just as metal-poor as Astra,'' she suggested. ''If the whole system formed from the same cloud of dust . . . no. Doesn't work, does it?''

''Not when we know the Rooshrike are mining metals on the first planet,'' Hafner agreed. ''Besides which, some of the smaller asteroids were analyzed by the original survey team and turned out to have a reasonable metal content. No, whatever happened here happened only to Astra.''

They rode in silence for the next few minutes. Ahead, the hazy cone of Mt. Olympus gradually became sharper, the low angle of sunlight showing first the gross and finally the fine structure of its surface. Hafner watched with undivided interest, eyes probing for clues as to the type of lava that had formed it. The steepness of the cone suggested viscous lava flows, which on Earth would mean a predominance of andesitic rock. On the other hand, he could see little evidence of the surface characteristics that usually accompanied that type of lava. Still, if the volcano had been dormant for a long time erosion would have altered many of the visual reference points. As with everything else in geology, there was ultimately no substitute for physically digging out the rocks and analyzing them.

''What about some weird process that breaks the metals down?'' Carmen spoke up abruptly. ''A nuclear fission sort of thing. Maybe it's some organism's way of producing energy.''

''Chemical energy is a lot safer to work with,'' Hafner grunted. An interesting idea . . . but the flaw was easy to find. ''Besides, that would only get rid of elements in the bottom half of the periodic table. Sodium is far too light a metal to fizz, but Astra hasn't got any of it, either.''

''Oh. *Wait* a minute.'' She threw him a puzzled look. ''No sodium either? But I thought Astra's ocean was salty.''

''Not really. There's a fair assortment of stuff dissolved in it, but none of it strictly qualifies as salt. A salt, you see, is formed by replacing the hydrogen atom in an acid by a metal, as in hydrochloric acid to sodium chloride. Without metals, the acids remain as is or make bonds with oxygen or silicon.'' He shook his head. ''We're sitting on a genuine treasure trove of strange chemistry here. Compounds that wouldn't last five seconds on Earth are just lying around waiting to be examined. I think we're up to eighteen brand-new carbon compounds alone since we've landed.''

''Anything valuable?''

''You mean in terms of sending to Earth? So far, no. But we haven't even

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scratched the surface. We'll find *something* useful here—I'm sure of it."

"I hope you're right." She paused. "All right, I'm starting a clockwise circuit of Olympus. Pick your spot this time around, because I've got to get the flyer back soon."

"Right." A metallic glitter a few kilometers south of the cone caught Hafner's eye; but even as he opened his mouth to shout the discovery he realized what it was. Even with the incredible scarcity of metal, no one had yet found it worthwhile to come out here and scrape up all the tiny fragments of steel and magnesium scattered across the landscape by the ill-fated Flyer Two. Shivering, he resolutely turned his eyes back to the volcano.

He found the spot he was looking for in less than half a circuit: a small lump halfway up the slope that might indicate an old pipe vent. "There," he told Carmen, pointing. "It's at least a ten-degree slope, though—can this thing handle that?"

"Easily," she told him. The dull background roar changed pitch as she switched back to vertical thrusters. Three minutes later they were down.

Hafner's core-sampling equipment, while bulky, was not very heavy, and it took only fifteen minutes to unload it from the flyer and move it out of range of the repulsers. "Now you sure you're going to be all right?" Carmen asked as he dropped the last load of bracing bars onto his pile.

"I'll be fine," he assured her. "It's not like this is my first time on an all-day expedition, you know. I know what I'm doing."

"Fine. Okay, then, I'll be back to pick you up around twenty hundred. 'Bye."

It was closer to twenty-one hundred by the time she returned, but the delay didn't especially matter to Hafner. With all his samples taken, he had nothing to do for the moment but sit on the ground and brood . . . and brooding he could do anywhere.

"Zilch," he told Carmen as the flyer lifted off. "Not a single bit of metal in any of the half-dozen samples I ran."

"So that means Astra's magma is metal-free, too?" she asked.

"I don't know. Maybe I just got anomolous samples. The rock looked more heat-treated than actually melted—and no, I don't know what could account for that. Say, would you take me the rest of the way around before we head back? I might as well look for a second test site while we're here."

The flyer tilted slightly as she complied. "I'm afraid it'll probably be a month or so before you'll be able to get back—I don't think I'd better pull this trick again."

He grunted. "Unless the borings show something promising it'll be a good stretch longer than that."

For a moment he studied the ground in silence. Directly ahead the blue water of the Dead Sea glinted in the fading sunlight; a couple of kilometers to the west of it he again saw the wreckage of Flyer Two. To his immediate right Olympus sat profiled against the multicolored western sky, and he noticed for the first time that the southern slope of the volcano seemed climbable, a bit of information he filed away for future reference. As the flyer continued its

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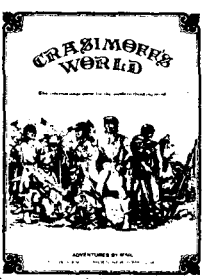

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slow circle the Dead Sea began to disappear from his view. He glanced one final time at it . . . and frowned. "Carmen, take us back to the east, would you? There's something funny in the Dead Sea."

"What is it?" Carmen asked as the flyer banked to the left.

"I'll let you know in a minute."

Seconds later they leveled out, bringing the Dead Sea into Hafner's view again. "Look down there," he told her. "The Sea's northwestern shore. See it?"

"You mean that white stuff? Looks like the offshore mineral deposits near the colony."

"Right. Like its namesake, our Dead Sea hasn't got any outlets, so minerals collect there. As the water evaporates some of them are left to encrust the shoreline. But why only on the northwestern side?"

"Well . . . why do the offshore deposits only show up near Splayfoot Bay?" she countered.

"Presumably they're just more visible there because the continental shelf has a very gradual slope," he said, with waning enthusiasm. "You're right; it's probably something like that. Let's go on home—I think I've had it for one day." *A fast dinner and right to bed,* he told himself firmly. *For once, the samples can wait till tomorrow.*

An hour later he was at the lab, eating a sandwich at his desk as the analyzers chugged industriously away. The results, when they finally came, were painfully predictable: no metal, of any sort, in any of the borings.

Chapter 8

". . . and un*less* the military leaders become more responsive to the people, there will *never* be the close cooperation and mutual respect that distinguishes a people from a mere assemblage of individuals." Perez paused for a smattering of applause, led by the other four Hispanics on the Council.

Grimacing, Meredith slapped the video player's off switch, blanking the screen as Perez's image began speaking again. "Quite the demogogue, isn't he?" the colonel commented.

Carmen looked as uncomfortable as her image on the tape had. "There's very little I can do," she told Meredith. "He *is* a duly elected representative, and I think it's obvious he speaks for the other Hispanic councilors, as well."

Beside her, Major Brown cleared his throat. "It seems to me, Colonel, that all these thinly-veiled demands for Council authority could be construed as incitement to disaffection. Maybe we could get him sent back to Earth on that basis."

"I doubt it." Meredith shook his head. "It's becoming rather clear that he was shipped here specifically to get him out of the Arizona authorities' hair."

"The hell," Brown growled. "What are we running here, Devil's Island West?"

"Not yet. But almost certainly someone's been thinking along those lines. Or hadn't you noticed the odd mixture of highly-skilled scientific people and low-to-moderately-skilled Hispanic laborers?"

"You didn't find that significant a month ago," Carmen put in quietly.

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Meredith looked at her. "No, I didn't," he agreed. "I've had time to think about it since then. It's pretty clear that, at least as of our departure date, Congress hadn't really decided whether or not it really wanted us to succeed. At least a dozen Senators thought the UN was playing us for fools, putting just enough international support in to keep the U.S. from simply cutting its losses by pulling out. An even bigger group was sort of behind us but busy arranging cover for their own tails for whenever we eventually failed. *Somewhere* in all that hostility someone surely ran the numbers and realized that Astra doesn't cost much more per person than a maximum-security prison —and if we get any reasonable agriculture going that price tag will come down." He paused, taking a moment to get out of what had been referred to as his preachy mode. "You'll forgive my slight bitterness toward Congress, Olivero, but it should be clear now why Perez's high democratic goals have *got* to be cooled down. I don't want us to be ordered home on the grounds that we're spending too much time rioting to accomplish anything, and I *don't* want anyone to start thinking how nice it would be if all troublemakers could be put this far away from the voters. You understand?"

"Yes, sir," she nodded. "I'll talk to Perez, see what I can do."

"I'd appreciate it. Thank you for dropping the tape by—I'll have it returned after I've finished with it. Dismissed."

She stood to go, and as she did so Brown's phone beeped. "Yes?" the major answered. "... *what?*" He looked at Meredith, a look of disbelief on his face. "Martello Base says all the tools in the flyer hanger are gone—along with the shelves they were stored on."

Meredith keyed his own phone into the connection. "Meredith here. Put a guard on the docks immediately."

"Already done, Colonel," the duty officer reported. "We've started a full search and are checking to see if anything else is missing."

"Good. Major Brown and I will be right there. Keep us informed." He broke the connection and headed for the door.

Brown was already halfway there. "Why would anyone bother with the shelves? They'd have to disassemble them even to get them out the door."

Meredith suddenly noticed that Carmen was still in the room, standing with one hand on the knob. "Get back to your computer," he ordered her. "Call up a description list of the tools stored in that hanger and put it out on the military net under a theft alert."

"Yes, sir." She frowned. "I don't like this, Colonel. It doesn't sound like a normal burglary to me."

"We'll find out soon enough. For now, just get that alert out."

It was only a two-minute car ride to Unie's docks; but even before the colonel, Brown, and Andrews arrived there Carmen's hunch was proved correct as new and increasingly bizarre reports began to flood in. In Ceres, a tractor lost its harrow—somehow—while working on a new section of field. In Wright, a bulldozer sank out of sight in ground that wasn't even remotely swampy, leaving only various hoses and glass parts to mark the spot where it'd

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been. The rattled operator had had to be sedated, as had two of the five workers who lost their shovel blades in an attempt to locate the vehicle. And Martello called back to report that shelving all over the base was missing, as were large numbers of tools. Spare parts, in cardboard and plastic boxes, were left in piles where the shelves had been.

Andrews was the first one actually to come out and say it. "It's the metal," he said as they piled out of the car and jogged to the nearest motorboat. "It's all disappearing into the ground."

"That's impossible," Brown said, without conviction.

"Of course it is," Meredith snapped as he stepped off the dock into the boat's stern and swiveled the motor to drop the propeller shaft into the water. "But it's happening, isn't it?"

Andrews threw off the bow rope and gave them a hefty push toward deep water. Simultaneously, Meredith hit the starter and they were off.

For about two seconds. Then, abruptly, the motor's roar became an anguished squeal that echoed in Meredith's ears even after he slapped the throttle back down. Cursing, he reached for the starter again . . . but halfway there he changed his mind and instead swiveled the motor back out of the water.

From the waterline down, the shaft had simply vanished.

Meredith looked up to find both Andrews and Brown staring at the ruined motor. Finally, Andrews shifted his gaze to Meredith and cleared his throat. "I guess whatever's stealing our metal works underwater, too."

There was nothing even Brown could say after that. In silence the men unshipped the boat's oars—plastic ones, fortunately—and headed back to shore.

The chaos lasted three hours more, and Meredith considered it a tribute to his officers and men that the colony remained as orderly as it did. Pockets of panic among the civilians were quickly defused by a combination of authoritative orders and up-to-the-minute information. One unexpected plus was that no one's life seemed to be in immediate danger; a series of quick tests on the plants and fish indicated that living tissue was not subject to the general metal loss, and Meredith was able to broadcast assurances that standing on furniture was unnecessary. The few people who went into hysterics anyway because they had touched the ground were bundled off to their local infirmaries, where they could be kept away from their already edgy neighbors while the doctors calmed them down. For a while, Meredith had teams of soldiers searching for equipment that might be salvaged, but soon gave the effort up. Metal not directly in contact with Astra's surface was untouched and apparently untouchable; for everything else, it was already far too late.

As it seemed to be, in fact, for Astra as a whole. When the phenomenon finally ceased, it left behind a ruined colony.

It was nearly sunset before the final list came through. Scanning the pages of close-spaced computer print, Meredith felt a numbness settle in over his mind. Tools, heavy equipment, assorted spare parts—nearly a half-million dollars worth, not counting transportation

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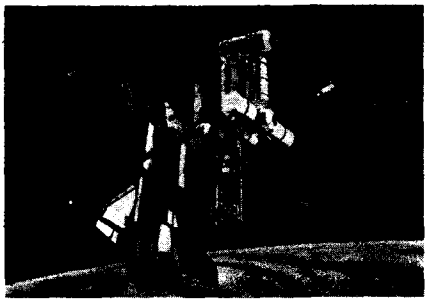

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from Earth. Exhaling heavily, he looked up at the four senior officers grouped around his desk. "Suggestions, gentlemen?"

Major Craig Barner laid aside his copy of the print-out. "Speaking only for myself and the Crosse contingent, I think we can recover," he said. "As long as it doesn't happen again we should be able to replace our losses. I see that plasticized undercoating on the boats seemed an effective counter; perhaps we can coat all our vehicles with it. Certainly we can learn not to leave smaller items lying on the ground; I taught my brother to do *that* when he was five."

"And the next time it happens, maybe it'll just pull harder—maybe hard enough to pull the metals out of *us*." Major Dunlop looked around the room. "Any idea how fast you'd die if that happened?"

"So you want to pull out?" Major Gregory asked. Meredith studied the other's face carefully, wondering where he stood. Gregory never liked committing himself early to a course of action, but his town of Wright had suffered even more losses than Martello had.

"Pull out, hell," Dunlop snorted. "I think we ought to teach those responsible a painful lesson."

" 'Those responsible'?" Brown frowned. "Do I take it you're blaming the Rooshrike?"

"Who else? We weren't even settled before they were down here snooping around and probably scattering micro-who-knows-whatsies all over the place."

"Why would the Rooshrike do something like that?" Barner asked. "They're getting *paid* to let us stay here."

"Who knows how their minds work?" Dunlop shrugged. "Maybe this is their version of hologames."

Barner snorted. "That's absurd—"

"Rooshrike guilt or lack of it is not at issue." Meredith interrupted what could have become a lively discussion. "Let's leave the impotent sound and fury to the UN, all right? The *only* question here is whether or not we use the five days till the *Aurora* arrives to pack up the colony." A beep from his terminal signaled incoming data. Turning to it, he scanned the report as it filled the screen. It was as bad as he'd expected. Tight-lipped, he pressed for hard copy and handed the single sheet to Barner. "Soil analysis report from Dr. Haversham," he told the group quietly.

Barner muttered something vulgar and passed the sheet on. "I never thought of that," he admitted, looking at Meredith. "That changes things, doesn't it?"

Meredith nodded, waiting silently as the others read the report. Every bit of the metal enrichment they'd added so carefully to Astra's fields had vanished.

"So what happens now?" Brown asked after a minute.

"Well, the crops are still alive, but unless we add more fertilizer right away they won't last very long. We've *got* the fertilizer, so that's not an immediate problem. But it'll essentially wipe out our next year's allotment, which means we'll have to go hat in hand to Congress to ask for more."

There was another short silence. "It seems to me," Gregory said at last, "that we ought to get some feedback

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from the troops and civilians before we make any final decision."

"I agree," Barner nodded. "Why don't we set up town meetings for tomorrow evening? That should give the short-lived emotional response time to pass. Get some idea as to their feelings, then meet together afterwards to compare notes."

"Sounds reasonable," Meredith said. "Objections or other comments?"

"Only that we might as well re-fertilize the crops, in that case," Brown suggested. "If we decide to leave we wouldn't drag the stuff back to Earth, anyway."

Meredith nodded. "I'll have the work orders logged on tonight. I guess that's it, gentlemen; you'd better get back and see to your commands."

They filed out. Picking up the missing-item list again, Meredith began going through it more carefully, noting especially those entries the computer had marked as irreplaceable. But he'd barely started when Andrews, waiting in the outer office, interrupted with an unwelcome announcement. "Colonel, Cristobal Perez is here to see you. Council business, he says."

Meredith grimaced. "He always does. All right, I suppose you might as well send him in."

"Yes, sir. Uh—Miss Olivero and Dr. Peter Hafner are also here; they've been waiting about a half-hour."

Hafner? Oh, yes—the scientist who'd helped ram through the Council setup. Probably all three were there to make the same complaints. "Send the whole batch of them in," he sighed. "It'll probably save time."

"Yes, sir."

He'd rather expected Perez to stomp in blazing with righteous indignation, and was disappointed only in degree. The Hispanic was mad, all right, but had toned down his expression and posture to something reasonably short of impolite. Carmen and Hafner, by contrast, seemed more thoughtful than anything else. Meredith considered greeting them first, just to annoy Perez; but the latter's open hand slamming down on his desk effectively removed that option.

"Colonel Meredith," he said with cold formality, "you are holding without reason eight Hispanics from Ceres and Crosse. I demand they be released at once."

Meredith returned his gaze steadily. "The Hispanics you refer to went hysterical earlier today and are undergoing standard post-trauma treatment—along with a handful of Anglos, if that makes you feel less picked on."

"So those who attempt to alert the populace to your ineptness are drugged and locked away. Is that your idea of responsible command?"

Meredith shook his head tiredly. "What the hell are you trying for, Perez? You can't make a ploy like that go anywhere—everybody on Astra knows those people had to be calmed down. In half the cases, their neighbors called *us*."

"I am trying for nothing but justice and competent leadership," Perez said. "This incident has demonstrated beyond a doubt the Army's inability to defend the people and property of Astra against attack. We received no warning, no useful instruction—"

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"And I suppose you and your Council would have done better?"

"If we were given the authority we deserve—"

"I doubt if anyone could have done anything," Hafner interrupted. "I'd guess that what happened here today has happened several times in the past hundred thousand years."

Meredith and Perez both looked at him, Perez as if seeing him for the first time. "What's that supposed to mean?" the Hispanic demanded.

"Just what it sounded like," Hafner replied. "Something's been leeching metals out of Astra's crust since at least before the Kaf Mountains were formed."

Meredith shifted his attention to Carmen, cocked an eyebrow questioningly. "I thought you should hear Dr. Hafner's theory as soon as possible," she said. "It makes a lot of sense, and I was afraid it would be bounced by someone if he sent it through channels."

Meredith nodded and leaned back in his chair. Listening to all this would at the very least buy him some time to figure out what to do with Perez. "All right, Doctor, let's hear it. For starters, how do the Kaf Mountains figure in?"

"If you examine the rocks there, you find out two interesting things: the mountains were formed recently, geologically speaking; and they were formed *after* the metals were removed from the crust."

"Who said there ever *were* metals on Astra?" Perez interrupted. "You're arguing your conclusion."

Hafner gave him an irritated look. "This isn't a freshman logic class. I'm describing what turns out to be a self-consistent scenerio."

"You're welcome to leave if you're not interested," Meredith offered. The Hispanic sent him an angry glare; Meredith ignored it and looked back at the geologist. "Why couldn't they have formed earlier?"

"Because most of the rocks in Terran mountains involve reasonably high percentages of metals—aluminum, iron, and sodium in particular—and if you suddenly pulled all those atoms out you'd completely destroy the structural strength. I haven't had a chance yet to study the satellite photos, but I'd bet we'll find evidence of collapsed mountain ranges now that we know to look for them. The Kafs, on the other hand, are composed almost entirely of christobalite—silicon dioxide—and moissanite, a silicon-carbon mineral. In other words, they're made of the strongest rocks available *after* the metal was gone."

"I see." This was starting to make altogether too much sense, and Meredith didn't like that at all. "You said it had happened several times . . .?"

Hafner nodded. "Some of the meteor craters have been formed more recently than that, and they almost certainly brought metals in with them. The fact that those metals were gone before the Rooshrike surveyed Astra means this happened at least one more time."

"You keep saying the metal is 'gone,' " Perez said. "Gone where? The center of the planet? And more importantly, *how?* I don't know much chemistry, but I *do* know yanking iron atoms out of a solid hammer ought to be impossible."

"Agreed." Hafner shrugged. "So should getting those atoms to slide

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through the soil. *I* don't know how it was done, either; but I *might* know where to look for the answers."

Meredith straightened up in his seat, belatedly touching his terminal's *audio record* button. "The Rooshrike base?"

"No, I'm pretty sure they aren't involved in any of this. The source of the effect is on Astra . . . and I *think* it's a localized source, as well." He hesitated. "I suppose I should explain my reasoning on that one. Basically, I'm assuming this leeching effect singles out metals because of their electrical conductivity, which probably implies the mechanism is electromagnetic in origin. Anyway, it occurred to me that ions dissolved in water also act somewhat like conductors, and that whatever force draws the metal atoms might draw those ions, too."

Meredith had a sudden flash of insight. "The offshore mineral deposits. Right?"

Hafner blinked in obvious surprise. "That's exactly right, Colonel. When the ions reach shore and come out of solution, their conductivity disappears and they don't go any farther into the ground."

Meredith tapped some computer keys, and seconds later had a map of the offshore deposits. "So the reason only this continent is bordered by the deposits is that the metal is being drawn and deposited *here?*"

Perez snorted. "A great theory. With twenty-five million square kilometers to search for this alleged El Dorado, it would be years before you could be proved wrong. Except that we already *know* the metals aren't here."

"Not necessarily," Meredith countered. "All we really *know* is that they have to be deeper than the Rooshrike's half-kilometer range. And as for finding it, that much metal should be a gigantic mascon. A properly positioned geosat could pinpoint it in days—" He broke off at Hafner's look of strained patience. "Or do you have an easier way, Doctor?"

"I think so." Hafner leaned over the desk, touched the coastline on both sides of Splayfoot Bay. "The deposits are closest to the surface along here, which indicates to me that the El Dorado, as Mr. Perez calls it, is somewhere to the east and relatively close to us here. However—" he shifted his finger —"when Carmen and I flew over the Dead Sea last month, we found very similar deposits—but on the *northwest* shoreline."

There was only one logical conclusion, and Meredith reached it without trouble. "Mt. Olympus. The volcano."

Hafner nodded solemnly. "Mt. Olympus—except that it's *not* a volcano. The rocks don't show the characteristics of lava flow, and the overall shape doesn't fit with the viscosity of the samples I took." He hesitated, but only for a second. "Colonel, I realize all this sounds pretty unbelievable, and I'm painfully aware there are a lot of questions I haven't got even half-baked answers for yet. But what happened today can't be explained by any science I know of—"

"You want to take an expedition to Olympus for a closer look?" Meredith interjected mildly.

"Yes, sir. And the sooner the better."

The colonel shifted his attention to

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Carmen. "I take it you've already checked out the logistics?"

She reddened a bit. "Almost everything Dr. Hafner would need seems to be available, sir," she said. "I haven't logged any orders yet, of course, but all it would really involve would be pulling one of the flyers off survey work and three or four mountain-trained soldiers from routine duty."

"A pilot?"

"I thought I'd do that myself. All the pilots are technically due for down time, anyway."

"Um. Actually, Doctor, your theory sounds a lot more believable than anything else I've heard this afternoon. When do you want to leave?"

"Just a minute, Colonel," Perez cut in before Hafner could speak. "I don't know whether you two cooked up this bafflegab smokescreen together or whether it was a solo effort, but it is *not* going to get you out of answering my charges of mismanagement."

Behind Perez, Hafner took a half step forward. "Unless you have a couple of advanced degrees I don't know about, I'd suggest you keep blanket assessments to yourself," he told the Hispanic shortly. "*I* know what I'm talking about, and I doubt very much that you do."

"And as to your ridiculous charges—" Meredith began.

"Why don't you come with us tomorrow, Cris?" Carman interrupted suddenly.

All three men looked at her. "To Olympus?" Perez frowned. His eyes flicked to each of the others, as if looking for a trap. "Why?"

"Why not? It would give you the chance to see Peter test his theories. You could be sort of an unofficial observer for the Council."

"The Council doesn't need any observers there—unofficial or not," Meredith growled.

Perez sent a tight smile in the colonel's direction. "Your point is well taken, Miss Olivero," he said, bowing his head briefly. "I accept. With the doctor's permission, naturally."

Carmen shifted her eyes to Hafner. "Peter?"

Hafner's expression was that of a man facing a tax audit, but he shrugged fractionally. "As long as he stays out of the way," he said. "We're leaving before sunrise, though—I want to be ready to start climbing as soon as it's light enough."

Perez's smile this time had a trace of bitterness to it. "Those of us who work the fields are used to rising early."

"Um." Hafner's irritation seemed to soften a bit. "Well, be at Martello by four o'clock. Colonel, thank you for your time and permission on this. I hope we'll have some answers for you when we get back." He took Carmen's arm and together they left the office.

"You're invited out, too," Meredith told Perez.

"Of course." The Hispanic walked to the door, paused with his hand on the knob. "But this matter is *not* settled, Colonel. Miss Olivero's efforts to sidetrack me have merely postponed the inevitable." Turning, he wrenched open the door and strode through it.

Deliver me from demagogues. With a sigh, Meredith let himself sag from the straight-backed military posture he'd adopted for Perez's benefit. Once, he'd

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thought this command would be the sure way to that long-awaited general's star; later, as the survey reports came in, his optimism had waned, replaced by grim determination. After today—

After today, he'd be lucky to keep his eagles. Or his butt.

But until the scapegoat-hunters in Congress got to him, he was still in charge; and neither hell, high water, Perez, nor Astra itself was going to change that.

Picking up the missing-items printout again, he began making a list for the *Aurora* to take back to Earth.

Chapter 9

The early morning air was relatively cool, but nothing, Perez decided, compared to the chill in the flyer's cockpit as the expedition burned through the sky toward Olympus. Carmen's scientist friend—Hafner—clearly still considered Perez an unnecessary bit of luggage, and had rather pointedly taken the co-pilot's seat, leaving Perez to rattle around in back with the three soldiers and Hafner's assistant. Perez hadn't argued; he'd simply folded out the emergency jumpseat behind Carmen's station and settled in, ignoring Hafner's order to find a safer seat. The view was lousy, and as his presence seemed to put a damper on Hafner's talkativeness he didn't learn anything useful. But he'd long since learned that distinction was a vital ingredient of power, and for that reason alone he would willingly have put up with the jumpseat. Actually, he found the situation rather amusing, as well.

Still, it was probably a good thing the trip was short.

The eastern sky was glowing but the sun not yet up when they landed south of Olympus's cone. The climbing equipment, Perez noted with secret relief, was the kind suited to straightforward trips up easy slopes—apparently the more advanced rock climbing skills weren't going to be needed here. Whatever else Hafner might be, he *was* a decent organizer: ten minutes after landing, their route pointed out to them on map and terrain and the equipment distributed, they began to climb.

And five minutes later, they had their first casualty.

"How does it feel?" Hafner asked as he carefully removed Carmen's left boot and felt the skin below.

"About like a twisted ankle always feels," she snorted, tight-lipped with pain and anger. "*Damn*. Of all the stupid times to fall over my own feet."

"Better now than later," Hafner countered. "It'll be easier to get you down to the flyer from here."

"I'll be all right." She struggled to her feet and eased some weight onto her left foot. She managed not to wince, but she didn't leave the weight there long, either.

"Uh-uh." Hafner shook his head. "Nothing seems broken, but you're not going to be walking on that foot for a while, let alone climbing mountains." His eyes swept the group; settled briefly on Perez, then moved to one of the soldiers. "Sadowski, help Miss Olivero back to the flyer and stay with her."

"Yes, sir." The man stepped forward and put his arm around her waist.

Reluctantly, Carmen shifted her grip from Hafner's arm to Sadowski's shoulder. "All right. But keep your radios

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on, okay? I want to hear what you're doing."

"Sure." Hafner nodded. He waited until the two of them had taken a few steps downslope before turning and starting up again.

They climbed for another half hour in relative silence, most of the conversation between Hafner and his assistant Al Nichols. The technical jargon was annoyingly cryptic, but Perez got the impression they were making a catalogue of anomalies to be found on and about the volcano. Apparently, Hafner's contention that Olympus was something else was still open to debate. A sliver of sunlight broke the horizon, and with the official coming of day Perez felt his step lightening, raising his spirits along with it. A southerly wind began whispering at his back, as if Astra had noticed the tiny band and was offering her help. At this rate they'd be at the summit in no time—

He almost bumped into Hafner as the geologist abruptly stopped. "What's up?" he asked, his growing contentment changing to irritation at the near-collision.

Hafner turned, and the look on his face made Perez's eyes narrow. "What's wrong?"

"Don't you feel it?" Hafner shot glances at the other three, now grouped around them. "Don't any of you feel it? We're *light*—we're *too light*."

"We *are* climbing a mountain—" Perez began.

"Al—stopwatch," Hafner cut him off. He dug a heavy-looking hammer from his pack and was holding it in front of him and a few centimeters above his head by the time Nichols had the watch ready. "This is just about two meters up; Astra's gravity is about three percent under Earth's—" he tapped his wrist calculator— "so it should take about point six five seconds. Ready; on one: three, two, *one*."

Perez had never paid much attention to things like this; but even to him the hammer's fall looked somehow wrong. Nichols's slightly choked report merely confirmed it: "Point eight two."

Someone swore gently. "Try it again," Hafner said. "Three, two, *one*."

This time it took point eight five second to hit the ground.

"You must have calculated wrong," one of the soldiers suggested.

"No," Nichols said. His eyes were darting everywhere, squinting when he faced south into the wind. "No, I checked his numbers. For it to take point eight second to fall, it'd have to start three meters up. We're *not* making an error that big."

"Broken stopwatch, then," the soldier persisted.

"Or maybe the wind is affecting it," Perez offered. "It's been picking up for the last few minutes."

Whatever the revelation was, it hit Hafner and Nichols simultaneously. "Damn," Hafner breathed. "We'd better try it again, Al—and then get the hell out of here."

He dropped the tool again; it hit the ground point eight nine second later.

"All right, everyone; down the mountain," Hafner ordered, his voice sharp with apprehension. "*Move*."

They moved. Perez hadn't realized just how strong the wind had become until he started pushing through it, and

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it scared him more than the falling hammer had. "What's going on?" he yelled over the gale in his ears.

"The gravity around here is decreasing," Hafner shouted back, his words barely audible. "Maybe even goes to zero someplace upslope. All the air's shooting up the mountain and out into space!"

Perez's heart skipped a beat. "But that's impossible."

"So is a planet that eats shelves and bulldozers," Hafner retorted. "Save your breath for running."

Swallowing, Perez tried to increase his speed. *This can't be happening!* he thought wildly—but he knew full well that that was nothing but emotional wishmaking. He could *feel* the bounce in his feet now, the extra time it took to come down from a running step. And—whether an effect of the wind in his face or not—it was getting harder to breathe.

At his hip his radio buzzed. Fumbling it out, he thumbed up the volume and pressed it against one ear.

It was Carmen, calling on their general frequency. "—*down* the mountain; repeat, the wind here is coming *down* the mountain, not *up*." There was a moment of silence. "Peter, did you copy? I said—"

"I heard you," Hafner's voice cut in, his panting just barely audible. "It doesn't make sense—wait a minute. Everybody; hold it a minute. *Hold It!*"

They came to a disorganized stop, crouching down against the wind. "Who's got a good throwing arm?" Hafner called. "Wilson? Here—take this." He handed one of the soldiers his hammer. "Now throw it—as far as you can—toward the flyer."

Wilson straightened, braced himself momentarily against the wind, and threw. The hammer arched into the air toward the distant silvery shape below, reached its peak and started to fall—

And slammed straight down with blinding speed, disappearing into the ground where it landed. Even through the gale Perez heard the *crack* of its impact. "What—?

"Forward again—carefully," Hafner ordered, his voice grim. "Don't get too close to the hammer. Carmen, get this and get it right; I may not have time to repeat. There's a zone of high-gravity surrounding us—I don't know how wide—that's got us trapped in here. We're losing air fast. Whatever we've got here must be pretty important for a defense this wild to be set up around it."

"Peter, listen to me." Carmen's voice sounded odd in Perez's ears. The first sign of asphyxiation? "I can bring the flyer in there and pick you up. Just hold on another few minutes."

"No! The way the hammer fell—must be a hundred g's or more in there. You'd never make it."

The group had stumbled to within sight of the hammer-dug hole now, and the hurricane wind had cut back to a stiff breeze. Perez's mind felt somehow sluggish, and it took him several seconds to realize that that was bad: less wind implied less air. Beside him, Hafner stooped and picked up a pebble. He lofted it ahead of them; it slammed to the ground a millimeter from the late hammer. "Everyone on the ground . . . right here," the geologist ordered,

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breathing heavily. "There may be some . . . air leakage from . . . other side. No moving, no . . . talking. Save your strength."

Perez dropped awkwardly to the ground, positioning himself with his feet pointing upslope. Directly above him the sky was markedly darker than it had any right to be. Against it, Olympus's cone looked unreal, the side not directly sunlit almost black. Beneath him, the ground seemed to vibrate, and he almost laughed. An *earthquake* on top of everything else? *Madre Astra, you work much too hard just to kill a few poor humans.*

The thought faded. Closing his eyes, Perez listened to the breeze and waited for the end to come. ■

CONTINUED IN NEXT ISSUE

CENTER FOR THE STUDY OF SCIENCE FICTION SF WRITING WORKSHOP

The Center for the Study of Science Fiction at the University of Kansas will offer a science fiction writing workshop this summer from June 3 to July 26. The course takes the place (this year, at least) of the Intensive English Institute on the Teaching of Science Fiction, held at the Center for the past 8 years.

The course, under the direction of James Gunn, will offer 3 graduate hours of academic credit. Professor Stephen H. Goldman, associate director of the Center, will give an optional complementary course in science fiction literature.

The Writers Workshop will meet from 7:00 to 9:30 P.M. on Mondays and Thursdays; the literature course, from 3:00 to 5:30 the same days. The basic cost is $47.00 per credit hour for Kansas residents, $103.00 per hour for non-residents.

On July 18, the Center for the Study of Science Fiction will present the Campbell Award for the best science fiction novel of the year, and will follow it with a two-day conference on the writing and publishing of science fiction.

Prospective students should send applications for admission and a manuscript to Professor Gunn, English Department, University of Kansas, Lawrence, KS 66045, by May 31. Student housing can be arranged, upon request, in apartments or dormitories.

Students who are not familiar with Kansas summer climate may note that it can be hot, but not persistently. Housing and classrooms are air conditioned, and Lawrence is in the wooded and hilly northeastern part of Kansas, some forty miles from Kansas City. The campus itself is noted for its beauty, and recreational facilities are excellent.

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Jay Kay Klein's biolog

Doug Beekman's hand-craftsmanship extends to his letters, done in the careful printing we are accustomed to see only in the balloons on cartoon strips. Born and raised in Findlay, Ohio, twenty years later he moved to the center of the commercial art world. There, he joined the Art Students League of New York for three years' study in painting and figure drawing.

He started reading SF at ten, which gave him a familiarity that has helped in portraying other-worldly places. When creating an illustration, he spends a great deal of time thinking about every aspect of the environment the characters will be placed in. And then he spends even more time thinking about the characters and their relation to the environment. What he wants are *real* people in *real* situations. He reads a story at least twice and tape-records important passages the second time, which he replays while sketching characters and scenes, doing a dozen or more simple roughs. Doug feels an important ingredient in every picture should be the expression of the story's theme or a revelation about a character. Without this, the artist is only painting people in settings, and this is something he thinks is a failing of 90% of contemporary illustrations.

Oil is Doug's preferred medium since it permits him to achieve the type of quality he insists on. It lends itself to edgework, handles more easily than other paints, allows the artist to modulate color, and can produce a rich surface. For black and white, pencil is first choice, with charcoal or mixed media when necessary for desired effects. When a sketch is approved for a cover he scales it up to 20 by 30 inches for final painting.

Doug lives now in Newfane, VT, close enough to commute to New York to see art directors and editors but out where there is the quiet he needs, complete with rolling hills, mountain streams, and forests. There he founded Buckhorn Studios in 1982 after lecturing at a number of Eastern art schools. He had discovered talented individuals who by the nature of the art market were likely to end up as teachers and paste-up people. He contacted them for portfolios and began promoting their work to the illustration field and galleries. Now these artists are creating art for major magazines, book publishers, and other markets. Some even do assignments for Davis Publications. Seeing artists progress like this pleases Doug immensely, and he is always happy to hear from anyone who would like to write him. ■

Doug Beekman

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David Brin

JUST HOW DANGEROUS IS THE GALAXY?

"The Universe has many more ways to be nasty, if it so chooses, than we had thought."

This was one conclusion we arrived at in the Science Fact article in the May 1983 issue of Analog. "Xenology, the New Science of Asking Who's Out There?" began straightforwardly enough, as an overview of the "Great Silence": the strange and apparently longstanding absence of extraterrestrial intelligent life. However, by the time it was over it seemed to lead us ever closer to a stark realization.

Something strange and perhaps very dangerous may be going on, out there.

Put simply, we should not have been alone this long. In fact, it seems we shouldn't even exist!

By all of the logic of contemporary science, the Milky Way should be teeming with commerce and conversation and the noise of millions of intelligent life forms—just as depicted in so many SF tales. Interstellar travel is not trivial, but it *is* quite feasible, according to many leading scientists. And even the simple starships that appear within a century's reach of our own crude technology should enable an expanding civilization to fill the galaxy in under a hundred million years, one percent of the age of the Milky Way.

The Earth should have been settled, not once but many times, over the last three billion years. The traces of past occupation of the solar system should be visible in the rocks and sky. And yet they are not.

Oh there were fables plenty, back when Europeans started exploring and conquering. But every "lost civilization" turned out to be one of our own—human. In tilling and excavating

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our planet, miners and builders haven't stumbled over the crumbled ruins of alien cities. They find no odd ores that are inexplicable by natural processes. Notwithstanding silly films about Easter Island and the Nazca Plain, there is simply no good evidence the Earth has ever been visited at all.

All it would have taken was a sandwich wrapper, dropped by a visiting alien during the pre-Cambrian Period, to have set off changes we could read today in rocks all over the Earth. For during that two-billion-year epoch nearly any invasion by outsider microbes might have overwhelmed our primitive ancestors, and left unmistakable traces. Obviously pre-Cambrian visitors were very tidy, or they never existed.

All this is strange, but the disturbing evidence of absence continues as we look upward.

Venus and Mars show no signs of ever having been terraformed, nor do the asteroids appear to have been moved or altered in any way . . . activities our great-grandchildren will presumably think everyday.

Finally, we haven't met any wise old alien star robots, as Frank Tipler of Tulane University calculates we should have by now. According to some fairly strong logic, such "Von Neumann probes" should have arrived long ago, and would have been waiting ever since for the Earth to evolve someone smart enough to talk to.

Well, we've got radio and space travel, now. But no friendly robot has said hello yet.

Where *is* everybody? Does this really mean we are alone?

Debate over this issue has come as a shock to believers in SETI (the Search for Extra-Terrestrial Intelligence). Just when they seemed to have won acceptance, suddenly they had to contend with jokes that Exobiology was "the only scientific field without a subject matter."

The argument has raged in some of the most prestigious astronomical journals, featuring a philosophical war of sorts between those who might be called the "Contact Optimists," led by Carl Sagan and Frank Drake of Cornell University, and the "Uniqueness" proponents, spearheaded by doctors Frank Tipler, Eric Jones, and Michael Hart. The discussions have been heated, at times even peevish-sounding.

Tipler, for instance, has claimed that Sagan's obsession with aliens arises out of some sort of inate human fear of lonelieness, which one rises above only with courage to face the emptiness that we will fill.

Sagan declares, in turn, that Tipler and his companions suffer from their own "innate human fear," that of the alien and the unknown. Of course it is only with courage that one rises above this fear to face . . .

. . . You see how the logic goes.

For detailed coverage of the debate in all of its complexities, the reader is invited to look up some of the references listed on page 000. Here we'll try to summarize the issue as it stands today, and go on to look over some of the letters readers sent in, in response to last

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May's article. We will see if some of you have offered up any new ideas.

The Retreat of the Contact Optimists

In June 1984, a new sub-unit of the International Astronomical Union gathered in Boston, devoted solely to discussing the question of extraterrestrial intelligence. At that meeting the trend of several years has continued. The "Contact Optimists" —those who have fought the hardest to believe we have neighbors in space—continued to beat an organized retreat. They have dug in behind fortress hypotheses—offering excuses for the tardy, laggard extraterrestrials—struggling to explain their strange failure to appear.

In so doing, the Contact forces have begun to sound downright gloomy. Indeed, they hardly deserve the appelation "optimists" anymore!

Starships are impossible, some of them declare.

The ETs kill themselves off before they get very far, others say.

Or extraterrestrials are pinch-pennies, who would shrink back from the challenge of the stars.

All this from the scientists who once carried the science-fictional banner. Strangely, it is their opponents, the Uniqueness crowd, who now cluster in excited circles at these conferences, chattering about starships and galactic colonization . . . colonization to be done by our descendants in a frontier galaxy.

Just who are the "conservatives" in an argument like that? We certainly do live in fascinating times.

* * *

In last May's article we asked for readers' reactions to the problem posed by the Great Silence. Before we get to those suggestions however, it might be a good idea to review the problem, briefly.

Many will recall our discussion of "The Drake Formula," for decades the main tool in thinking about possible distribution of technological species in the galaxy.

If "N" is the current number of technological civilizations in the Galaxy, then

$$N = Rf(p)n(e)f(l)f(i)f(c)L$$

where R is the average rate of star formation. $f(p)$ is the fraction of stars that are calm and long-lived and accompanied by stably orbiting planets. Factor $n(e)$ is the average number of planets per star system which have the requisite conditions to support life.

The other factors include $f(l)$, the fraction of these congenial planets on which life independently appears; $f(i)$, the fraction of THESE on which "intelligence" spontaneously develops; $f(c)$, the fraction of those intelligent species that attain technological civilizations, and L, the average lifespan of such species after attaining technology.

For what still seem fairly good reasons, Contact people assign rather high values to most of these factors. For instance, most astronomers tend toward the belief that good, "candidate" planets circling favorable stars should be fairly common. (Thomas Donaldson's article in the June Analog summarizes some of the issues involved in choosing a

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value for *n(e)*.

Similarly, modern biologists mostly seem to accept odds for life and intelligence which aren't fantastically small. (Some of Robert Freitas's "Xenology" articles in Analog deal with these topics.)

According to the old SETI logic a likely planet will contribute roughly 0.01 technological races during its history. Multiplied by several billion candidate systems, this results in an expectation that there could be anywhere around a million advanced species in the galaxy at this very moment.

Before 1975, when most scientists still thought interstellar travel was impossible, these numbers sounded just fine. A million scattered races, all living on the planets where they evolved, meant a mean separation of a few hundred light years between civilizations . . . perfect for a network of radio communications among patient, wise peoples. The SETI forces figured that, once their multichannel analyzers were finished and they got enough radio telescope time, they would stand a fair chance of tuning in on this galactic web of chatter and friendly advice within a generation or so.

And then the excitement would begin. Once Contact was made—the quiet assumption went—Mankind would never be the same.

As we have seen, the lovely logic fell apart under the realization that one form of starship or another really ought to be possible. With the introduction of travel, visitation, colonization, it becomes clear that an average separation of a few hundred light years is trivial. Not only is the Drake Equation no longer complete. We see that it doesn't even predict anything anymore!

When we introduce star travel we suddenly need three *new* factors:

–"*v*" representing the velocity with which an interstellar culture grows into space, pausing to settle likely solar systems and rebuild necessary industry before continuing its expansion again.

–"*L2*" which is the lifetime of a zone of colonization into which a species has expanded, after which the settled region becomes "fallow" once again.

–"*A*" an "approach/avoidance" factor, different for each culture, representing a "cross section for discovery" by contemporary human civilization. (In other words, how likely is it we would even notice them? For example, a culture with a preference for settling only comets would likely never even have visited the Earth, and might exist even now in our solar system without our having discovered them.)

By including these factors in the appropriate formulas one can put together an algorithm to try to predict "*C*"—the probability of contact between human beings and extraterrestrials. (Alas, one of the fundamental rules of *Analog* fact articles forbids us to go into a detailed discussion of the mathematics. Interested readers are refered to paper (1) cited at the end of this article, for those interested. However, one requirement is that all the equations must reduce back to the Drake Formula again if star-

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ships turn out to be impossible. The equations do.)

We now have a "morphological" way of looking at the problem. The seven factors of the old equation, plus the three new ones, give us a "space" within which to sort out our ideas, an organizational aid that was missing until now.

The ten probability terms are vital. It turns out the differences of opinion between the Contact and Uniqueness forces divide precisely according to WHICH of these factors each uses to explain the absence of prior settlement of the Earth!

Contact proponents admit that visits to Earth have been sparse, if they have happened at all. They merely choose different explanations . . . or excuses . . . for the fact that we have observed no beings from other stars.

Uniqueness advocates tend to concentrate on the left and middle of the Drake Formula. For instance, some claim that planets are more rare than has been popularly believed, or that many Earthlike worlds get trapped into Venus-type runaway greenhouse effects, destroying any chance of developing life. (Thomas Donaldson's article in the June *Analog* summarizes many of these arguments, although both his assumptions and conclusions are highly unusual.)

Other Uniqueness savants bitterly dispute this. Planets are plentiful, men such as Michael Hart say, but the odds of LIFE developing are far smaller than people tend to believe. Life *will* appear on all those worlds, Hart insists, but only after our descendants bring it there with them.

Still others, such as Eric Jones of Los Alamos, claim that it is the step to *intelligence* that was a fluke, here on Earth. It is unlikely to be repeated elsewhere.

Those on the "Contact" side disagree, of course. They believe the factors leading to technological civilization ought to be quite large. Technic societies should crop up all over the place. How, then, do the Contact forces account for the apparent absence?

Some, such as Frank Drake, still hang on to a belief that star travel cannot happen. Factor "v" does have its attackers, then, in the face of a tide of popular and inventive starship designs.

And hypotheses abound as to why extraterrestrials might CHOOSE to make themselves invisible . . . to avoid contacting us, or to abjure star travel even if it is possible, or to have neglected to settle our solar system in the more than three billion years that it has been prime real estate.

(The relevant "approach/avoidance" factor—"*A*"—was popular among those *Analog* readers who wrote in. A number of diverse reasons were offered for why ETs might have refrained from colonizing—or even visiting—the Earth. The range of ideas was enthralling and a tribute to the breadth of human imagination.

(But that's just the point! Any of those explanations might work for one or two alien races . . . maybe for a dozen. But if any ETs were as diverse as men and women, the excuses run into trouble. Can the Contact people seri-

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ously contend that, out of millions of races, SOME would not behave as humans do in so many SF novels . . . setting forth in their space conestogas to settle and alter their new homes?

(True . . . aliens "might think differently than we do." But if there are enough of them, ought not a FEW behave like us?)

As always, the most entertaining of the Contact Optimists is Carl Sagan. Anxious to find an excuse for the missing aliens, and too smart to disdain starships, he has come up with the most fascinating explanation of them all. And in so doing he and his colleagues have quite possibly done mankind a very great service.

Nuclear Winters

In the Christmas 1983 issue of *Science*, the prestigious journal of the American Association for the Advancement of Science, there appeared an article entitled "Nuclear Winter: Global Consequences of Multiple Nuclear Explosions." It has come to be referred to as "TTAPS"—after the initials of its authors, R.P. Turco, O.B. Toon, T.P. Ackerman, J.B. Pollack, and C. Sagan. In many ways this historical document has shaken up all prior thought over the potential consequences of modern major warfare.

If the models presented by the TTAPS authors are correct even within two orders of magnitude, one can only conclude that the present nuclear arms race between the great powers is a pointless waste of time and money. If they are correct, even a small, "limited" nuclear war will devastate the Northern Hemisphere and leave it barren of civilization, nearly denuded of life.

It would not be the fearsome blasts, nor even the lingering radiation, those fearful demons we have feared for so long. There is reason to believe some fragment of America or Russia might survive those effects.

Rather, it would be the cold and dark of a long, long winter that brought the great killing. Dust kicked up into the sky by as few as a hundred nuclear ground bursts, or soot launched into the stratosphere by airburst-ignited fires would, the scientists say, shut the world down into a frigid, years-long night from which very little would survive.

Far short of an effective "first strike," any party trying to launch a sneak attack would doom its own citizens to starvation, even if the other side never retaliated at all!

At least that is the contention of the authors of the TTAPS paper. In the months following the *Science* article there have been numerous reported followup studies, but the scientific grapevine has yet to tell of anyone who has successfully disputed the article's overall conclusions.

Very interesting—and perhaps vital for all of us to think about—but what has all this to do with extraterrestrials?

Well, there is reason to believe that the nuclear winter scenario had its birth in a struggle to find excuses for the absence of starfaring aliens!

In order to trace this kinked chain of logic, consider the position Contact proponents such as Sagan found themselves

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in, in recent years. Unable to convince themselves that starships are impossible, they had to come up with some universal mechanism to explain how both the *numbers* of extraterrestrial species and their *rate* of *colonization* and *expansion* could be small enough to explain the Great Silence.

Sagan's answer has been to propose the following:

Assume that two types of species achieve technology—the peaceful and the aggressive. Peaceful races will presumably not have the assertive, greedy drives that caused men and women to seize every opportunity to conquer and spread, here on Earth. These quiet civilizations will expand into neighboring star systems only slowly, if at all. So slowly, in fact, that we can excuse their absence by saying, simply "they just haven't arrived here yet!"

Only aggressive types would push ever outward, filling the galaxy as fast as the models of Jones and Hart and Tipler contend they would. And those species must first pass through a dangerous phase—that period between the discovery of nuclear weapons and the development of viable star travel.

Sagan maintains that there are only two ways to get through this extremely awkward and hazardous period. Warlike species either must cure themselves of their aggressive tendencies (in effect becoming "peaceful"), or they must die.

In other words, the "optimists" in this quandary are now suggesting that the galaxy is sparsely occupied by long-lived pacifists—who drive their starships only on Sunday, presumably—and by the ice-covered planetary tombs of all the rest . . . species who could not learn to control themselves.

But for this rationale to work, there had to be an easily-triggered mechanism for destroying civilizations. It must be more powerful even than blasts and radiation . . . so compelling that one could envision it happening again and again, to every warlike race that failed to make the transition to a calmer mode of life.

The nuclear winter appears to offer Sagan's brand of Contact aficionado just such a mechanism.

Did the TTAPS paper—so topical and hotly debated today—arise originally out of a desire to explain the absence of extraterrestrials? I do not know for certain, but it is an intriguing possibility. If that is the way the thought processes worked, it would have to be one of the most fascinating quirks in intellectual history.

The Chart of Explanations

Why do we seem to be alone?

All of the explanations offered have a quality in common. Each suggests a way to suppress one or more of the "factors" described above, in order to make the overall contact number fit the sparse (nil) observations. In an attempt to organize them for comparison, these theories have been arranged in a chart.

Uniqueness proponents say that technological civilizations rarely develop, and that some of the first four factors on the chart must be extremely small. Contact Optimists prefer to attack one or more of the four on the right, sug-

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gesting that there might be many alien races out there, but that they are short-lived, or slow to travel, or reluctant to make contact.

Many of these theories were discussed in the May '83 article on the Great Silence. We will go over them lightly here in review, and concentrate on those that got the biggest response from the readers.

Explanations for the Great Silence

As we've seen, the favorite explanations of the Uniqueness proponents have to do with ways in which the probability of spontaneous intelligence is suppressed.

Category One: *Solitude*

1. Habitable planets may be rarer than astronomers now believe. (Suppress factor *n(e)*.)

2. Some unexpected "spark" may be needed to initiate life out of pre-biotic compounds. (Suppress *f(l)*.)

3. The final step to intelligence may require some "software miracle" that makes it far more improbable than currently expected. (Suppresses *f(i)*.)

The problem with these ideas is that they seem to fly against the grain of most accepted modern science. But if they are right, we may simply be the first tool users ever to come along. We are the "Elder Race."

Does this stretch our credulity too far? Not according to some of our readers. A.J. Dunlop, S. Hervais, and Kathryn Drennan each wrote in to propose that the proper conditions for developing intelligent life might only have come about lately in galactic history. Each referred to the famed Russian scientist V.S. Troitskii's idea that until a few billion years ago conditions in the galaxy just weren't right yet.

Is it possible things simply weren't "ripe" until now? Certainly life had to wait until supernovas had spewed out enough heavy elements to make rocky worlds and organic chemistry possible. But those conditions were met long, long before the Earth was formed, and we are still left with the awkward question, "Why us?"

Still, the stew just might now have reached the point of simmering, and we could simply be the first to hop out of the pot.

4. Insatiable curiosity and manipulativeness, such as humans display, may be rare among intelligent species. (This effect would obviously suppress factor *f(c)*, the frequency of appearance of high-technology.)

Three readers wrote in suggesting this alternative. Poul Anderson said, "The puzzle is why we're as bright as we are. Pithecanthropus was doing all right." He proposes that intraspecies selection, especially sexual, became fierce in protohumans, leading to a strange animal that is uniquely clever and capable of fitting itself to live in vacuum or the bottom of the sea.

Kathryn Drennan of Glendale, California and John Bowling of Troy, Alabama, suggested separately that most HUMAN civilizations have been too conservative ever to have developed starships. To quote from Bowling's letter: " . . . Hero's steam engline . . .

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	n_e: number of useful planets per star	f_l: percentage develop life	f_i: percentage of f_l that gain intelligence	f_c: percentage of f_i that attain technology	L: span of isolated ETI	L_c: characteristic ETI colony lifespan	v: effective settlement expansion velocity	A_v: approach/avoidance factor
"SOLITUDE"								
1) Habitable Planets are Rare (1,3)	(−)							
2) "Spark" of Life Rare (4,5)		(−)						
3) "Spark" of Intelligence Rare (4)			(−)					
4) Few Intelligences Ambitious				(−)				
"GRADUATION"								
5) Undetectable Technologies (2)								(−)
6) New Realms Beyond Our Ken (SF)							(−)	(−)
"TIMIDITY"								
7) Aversion to Risk (2)							(−)	(−)
8) Self-Cure Against "Aggressive Tendencies" (2)							(−)	(−)
"QUARANTINE"								
9) "Zoo"								(−)
10) Fallow Preserve (1)								(−)
11) Awaiting Our Maturity (SF)								(−)
12) Covert Contact (SF)								(−)
13) Low Rent								(−)
14) Friendly Probes (3,6)								±?
"MACROLIFE"								
15) Greedy Planetary Breakup (1)	(−)							
16) No Contact With Nursery Worlds (1)								(−)
"DANGEROUS NATURAL FORCES"								
17) Galactic Spiral Arms (7)			−?	−?	−?		−?	
18) Falling Rocks (7)			−?	−?	−?		−?	
19) Black Holes, Jets, and "Things" (1,7)			−?	−?	−?		−?	
"DANGEROUS UNNATURAL FORCES"								
20) Migrational Holocausts (1)			(−)	(−)				
21) Planetary Breakup (1)	(−)							
22) Inevitable Self Destruction (2,8,9)						(−)		
23) Deadly Probes (SF)						(−)		
"OPTIMISM"								
24) Water Worlds (1)				(−)			(−)	(−)

CHART OF POSSIBILITIES

(−) means the effect is expected to be negative on one of the factors
(+) where it may be positive
(t) indicates where the author thinks the option might be testable.
Numbers in parentheses after listings are references.

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Roman aqueducts . . . Egyptian astronomy . . . What happened to the spaceships? The modern West did produce [them] . . . but is the modern West typical of [even] our one technological species?"

In other words, maybe the key was a not-too-likely cultural shift. Julian Jaynes, in his famous book *The Origin of Consciousness in the Breakdown of the Bicameral Mind*, proposed that such changes in the human being's software/firmware can be as important as all of the hardware development that went on as our brains grew.

There is one more variant on hypothesis four, called "Water Worlds," which the author holds in reserve for the end of this article.

Category Two: *Graduation*

5. It may be that technological species sooner or later discover *advanced techniques* that make radio and even colonization irrelevant (as suggested in numerous SF stories.) Conceivable as this idea seems, it is hard to believe any race would totally abandon the electromagnetic spectrum, whatever its other options.

6. It has been suggested that spacefaring sophonts might "graduate" to *other realms* or unimaginable endeavors, coming to look on planets and starships as mere toys. This would set a limit to the period of expansion, though not, perhaps, to exploration.

Either of these scenarios would lower our expected contact cross-section, "*A*," with such a civilization. They might also tend to reduce "*v*." As reader Bob Ardler of England put it, advanced sentients have so often been depicted as more powerful Londoners or New Yorkers ". . . stupid, quarrelsome sex maniacs who happen to fly and read minds." But truly advanced sentients could be quite different.

Category Three: *Timidity*

7. There might be reasons races develop an *aversion to spaceflight*. Discovery of immortality, for instance, might make individuals reluctant to take even the slightest risk. (Suppresses *v* and/or *A*.)

8. Those species who do not destroy themselves may, as Sagan proposes, "cure" themselves of aggressiveness, and so become *slow starfarers*. (Suppresses *v* and/or *A*, but increases *L* and *L2*.)

Chris Rohr of Petaluma, California, wrote in to suggest that intelligent species might all develop a form of telepathy, through mind-computer links, which would make their lives far richer than existence as mere individuals. If this happened, then people might be reluctant to venture too many light-days from the center of their civilization in order to avoid, in effect, lobotomizing themselves.

It is a clever idea. Still, it is hard to say it would apply in *all* cases, which is what we need from an overall explanation—one that works convincingly.

Category Four: *Quarantine*

9. One venerable SF idea explains the Great Silence by suggesting that the solar system is kept as a sort of "*zoo*."

10. Or benevolent species have a tra-

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dition of letting "Nursery Worlds" lie *fallow* for long periods, allowing new sentience to nurture on likely planets.

11. Observers might be *awaiting* mankind's social *maturity*, or may have quarantined us as dangerous. A galactic radio club might avoid too early contact with beginners like us in order to allow us to develop our own unique culture to contribute to the galactic mix.

12. A listing would not be complete without including the farfetched idea that aliens are already in *covert contact* with governments and groups on the Earth. There is a charming Poul Anderson story about this concept, in which the Earth's sole "member of the Federation" was an obscure tribe of southwest American Indians . . .

13. The *low rent* explanation suggests that the Earth has been simply too unattractive to be settled, or perhaps even visited by aliens. This idea was discussed in some detail in the May '83 article. For various reasons it would seem unlikely.

14. Finally, it is possible that Frank Tipler's famous probes—those variants on John Von Neumann's self-replicating robots which should make star exploration cheap and easy for even the timid—might behave just a little differently than Tipler has imagined. Perhaps there are scores or hundreds of these friendly probes, just sitting around in the solar system patiently waiting for us. It is conceivable that they do not consider mere access to radio sufficient proof that we are intelligent enough to talk to! Perhaps it is required that we prove our ability actually to go out there in person before they will deign to say hello.

Any of these ideas, if true, would dramatically affect the contact cross-section, factor *A*.

There is a problem with nearly all of the quarantine scenarios, unfortunately. They all appear to call for some degree of cultural uniformity in the Milky Way . . . some mechanism by which the pattern can have been enforced not just recently but for billions of years in a galaxy of constantly shifting neighborhoods and star formations. Such a rigid pattern would seem well nigh impossible to accomplish in a relativistic universe.

Our readers seemed to understand this. Few letters even referred in passing to quarantine.

Category Five: *Macrolife*

It is possible to imagine another set of reasons why the Earth was never colonized. Perhaps waves of interstellar wayfarers *have* passed this way. If they had to take millions of years along the way, living in vast "slowboat" starships, there might have been strong pressures selecting for the sorts of people who *like* living in space. It is conceivable they might come to abandon planet-dwelling as a lifestyle. This could lead to either of two different behaviors.

15. Truly space-borne sophonts might greedily *fragment* terrestroid *planets* for building material and volatiles, having a terrible effect on factor *n(e)*.

16. Alternatively, they might have a tradition of *cherishing "nursery worlds,"* protecting them without any conflict of

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interest or desire to use high-gravity real estate.

Alas, there is a problem with "*macrolife*," as well. We have looked over our asteroid belts carefully in recent years. These are the same small bodies that such starfarers would covet —which our own grandchildren may be melting and reforming in a century or so.

Current analyses appear to indicate that they have been untouched since the beginning of the solar system. No one, it appears, has ever disturbed them.

You will recall we began this article with the statement that "The universe has more ways to be nasty, if it so chooses, than we had thought." This conclusion is particularly striking when we take note that *none* of the explanations offered to this point really seem to explain the Great Silence in a truly convincing way.

What is needed is a *universal* mechanism, one that acts impartially and over extremely long time scales, which would keep the numbers of extraterrestrial species small or suppress their rates of expansion among the stars.

A few ideas have been proposed that seem to fit these criteria. The reader is warned that some of them might be unsettling.

If it is any consolation, I will try to finish this article with an *optimistic* scenario . . . one that satisfies all of the above criteria without being nasty. In the meantime, however, let us proceed to the long list of ways in which the Universe could be mean.

* * *

Category Six: *Dangerous Natural Forces*

Might there be aspects to the physical nature of the galaxy that make conditions hazardous to life or intelligence? Perhaps, as K. Arondee of Florida wrote in to suggest, the Earth is exceptional because it is among the few worlds lucky enough to have escaped some truly major natural disaster.

We have already mentioned the possibility that the Earth was lucky not to have fallen into the "Venus Trap" . . . the runaway greenhouse effect that killed our sister world . . . or the perpetual frozen tundra of the "Martian Trap."

Here are some other "natural" hazards. Any of them could have disastrous effects on factors $f(l)$, $f(i)$, $f(c)$ or L.

17. "Spiral Arms Are Dangerous." In its 230 million year orbit around the galaxy, our solar system is currently passing out of a gas- and dust-rich "spiral arm." We cross these regions of shocked gas clouds and hot, young stars every hundred million years or so. Passages through the thick portions of the galactic plane come about three times as often.

These can be dangerous events. Spiral arms are where dense interstellar hydrogen clouds are compressed to form new stars, and where supergiants flash through their tempestuous evolution to end their quick lives in supernova explosions.

It is not currently thought that these intermittent passages are so hazardous that life-bearing worlds are in perpetual danger of being sterilized, however the

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possibility is serious enough to merit consideration. Dr. David Criswell of La Jolla, California, and A.J. Dunlop of London have each proposed that advanced cultures would eventually tire of playing galactic roulette and leave the spiral arms for good—setting up shop out in the Milky Way's "halo" of stars that drift in long, lazy orbits out of potential harm's way. That could, they say, explain why we don't see anybody flying around this part of the galaxy.

Those who can leave, do.

18. "Falling Rocks." In the May '83 article we covered some of the reasons why many scientists now believe the dinosaurs were killed off by a giant meteorite impact. Indeed, as many as ten major ecological catastrophes can be read in the Earth's crust, when large numbers of species went extinct virtually overnight. The assumption today seems to be that the Earth, from time to time, suffers the equivalent of a "nuclear winter," caused by random impacts with drifting asteroids.

Are the collisions random, though? Papers have abounded, just in the last year, with hypotheses about cycles of destruction . . . rhythms of comet or asteroid infall driven by some hidden mechanism.

It has been suggested that a dark, small companion of the sun, called "Nemesis," or "Shiva," orbits far beyond the comet belt, dipping in every 26 million years or so to perturb icy and rocky debris into the inner solar system. Alternatively, interactions with the galactic plane, or spiral arms, might trigger such events.

In any case, one possible explanation for the Great Silence is that other solar systems are in even worse shape than we are . . . that other worlds are routinely and repeatedly smashed by cosmic debris, leaving us the first to climb up far enough to look around.

19. Jets, Black Holes, and "Deadly Things." In an article in the May 1984 issue of *Analog*, I discussed one other disturbing possibility . . . that our Milky Way contains an object or objects far more dangerous than mere shock fronts and falling comets. Radio astronomy has recently demonstrated that many galaxies contain powerful and dangerous "things" such as gigantic jets of relativistic particles. Modern theories suggest these beams of destruction are caused by huge black holes at the galaxies' cores. We have no idea if we share this galaxy with such frightful items, only that there is an upper limit to their size and energy. That still leaves a lot of room for small, but still dreadful terrors. (In fact, there is strong evidence for a "small" black hole, of a few hundred solar masses, near the center of the Milky Way.)

How does all this relate to the Great Silence? Well, let's imagine there *are* one or more such devils, and that we just happen to be on a rare orbit that avoids our galaxy's energetic monsters? If that were so it would certainly explain how we would be the first to survive long enough to reach the stars.

Category Seven: *Dangerous "Unnatural" Forces*

Nature could be malign, as we have

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seen. But there are other dangers, as well—dangers that might arise from life itself.

20. Migrational Holocausts. A question covered in detail back in May '83 was, "what happens to planets that are colonized by an expanding interstellar civilization?" In that article we saw that, unless the settlers leave large parts of their worlds fallow in wilderness preserves, or engage in "Uplift" bio-engineering of local higher animals, their mere presence is likely to prevent the appearance of local sentient species. A world is not likely to serve as a useful nursery of intelligence so long as it is occupied by a spacefaring race.

When the interstellar tenants finally vacate or die off, it may be a long time before a local species of tool users evolves. The worse the interstellar colonists treated their temporary colony planet, the more severe will be the effects on the delicate higher life forms, the very ones that would be expected to grow up into the next generation of starfarers.

By this scenario, the Earth might be the first Nursery World to have recovered sufficiently—since the last wave of "civilization" passed this way—to develop a species with intelligence. That would explain the apparent loneliness.

(In response to that 1983 article, David Rubin of Staten Island wrote in to suggest a new factor for the Drake Formula . . . $M(d)$. The M stands for "massacre" and the d for "dinosaur.")

This scenario would have dramatic effects on factors $f(i)$ and $f(c)$, and possibly L and $L2$, as well. The problem with the hypothesis, though, is that it suggests we should see signs of past colonization on the Earth. We do not.

21. Breakup of Nursery Worlds by starfarers hungry for building materials was an idea discussed earlier, under the category called "*macrolife*." Planets might die before they ever get a chance to produce intelligent species. This would certainly affect L and $n(e)$, the number of planets on which life can evolve. It is also chillingly consistent with the Great Silence. Earth could be the only Nursery World in the area to have been missed. If so, no wonder we have no neighbors!

22. "Inevitable Self Destruction" is another cheery theme we spoke of earlier. The TTAPS Nuclear Winter scenario tells us that many alien races, indeed, might have found themselves where we now stand, on the teetering precipice between self-ruin and self-control. The factors influenced here are clearly L, v, and A.

23. "Deadly Probes" takes the concept of Von Neumann self-replicating probes a step further, turning it into an idea familiar to SF readers. Both Saberhagen's "Berserkers" and the more sophisticated version discussed in the SF of Gregory Benford reflect the possible dangers of unleashing machine probes onto the galaxy without lots of forethought.

Suppose a thousand races sent out friendly robot emissaries, just like Frank Tipler has proposed. Now imagine only *one* instead dispatched monster machines whose sole task was to home in on sources of modulated radio and de-

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stroy them before the newly fledged competitors could spread out into the galaxy. It is a disturbing thought. "The Honeymooners" has passed Tau Ceti, by now. And it's too late to call back "I Love Lucy."

This scenario, severely affecting $f(c)$, L, and v, is completely consistent with the universe as we observe it. It need only have happened once for it to have become the status quo, keeping the galaxy silent and empty for billions of years. The possibility is quite chilling.

Category Eight: *A Grasp at Optimism*

The great debate seems to be a war among scientists all of whom grew up reading science fiction. The Contact folk, Sagan, Drake, etc., emphasize their dream of meeting other minds. Uniqueness people, such as Jones and Hart, openly state their preference for an empty galaxy in which our descendents can spread and prosper without competition from older, more advanced species.

In their attempts to explain the Great Silence, each side has tried to suppress one or more of the ten factors. The explanations have ranged from the patently absurd to the frighteningly compelling. And we've seen that the most convincing hypotheses appear to be the most disconcerting, as well.

Is there any *friendly* explanation for the Great Silence? Isn't there any way the universe could look the way it does and still let *both* sides get their dream—a galaxy with other minds to talk to and yet still wide open for our great-grandchildren to have adventures in?

I have managed to come up with one. You tell me if it works.

24. The "Water World Scenario." We have spoken of the possibility of a "Venus Trap" and of a "Mars Trap" which might pull Earthlike worlds in downward spirals toward conditions where life can't exist. Indeed, there are equations which indicate that both runaway greenhouse effects and permanent ice ages are potential "syndromes" for a vast variety of terrestroid worlds.

This leaves us with the impression that Terra miraculously found itself on a narrow fence between two death scenarios, and that might be true.

On the other hand, it might not. Some scientists believe that there is a deep valley, a cusp, between the Mars and Venus catastrophes. Within this valley there is another "trap," pulling all planets within its reach. It is the pleasant trap of the Water World.

The existence of life on Earth has had powerful repercussions. It has pulled most of the carbon out of the atmosphere and regulated the planet's temperature so that it varies less than the heat output of the sun itself. Most of all, it has featured the preservation of vast oceans.

If this turned out to be a common phenomenon, let us consider the possibility that *the Earth is unusually dry for a water world*. In other words, what if the vast majority of this kind of planet has far less dry land than the Earth?

Geneticists now know that species diversity and rates of evolution depend on the *size* of the environment involved. It is unlikely that land creatures would develop to the complexity they have on

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Earth on a world with only island archipelagos and tiny continents.

That does not necessarily mean that intelligence, per se, is impossible on such planets. After all, dolphins and whales are already pretty bright. But it does imply that there would be very few places where "hands and fire" beings would develop the technology and basic outlook of life necessary in order to take to the stars.

There might be millions of intelligent races out there, ignorant and uncaring about starships, preoccupied with their own oceanic adventures. The factor affected by this scenario is $f(c)$, the likelihood of developing technical civilization.

The result? Envision our descendants setting forth, as Jones and the others anticipate. They will find no other starfarers, and at first it will seem that they are all alone. At last, though, they will discover other minds . . . minds which pose no threat, no danger.

Intelligent whales, or squid, or octopus . . . why should they refuse the roving humans' request to make use of local asteroids upon which to build their cities and factories? If the strange-looking bipeds are willing to bring down exciting toys and machines, why not invite them to come and take their vacations on the shores of the "useless" little islands, to splash and play and exchange philosophy lazily under the balmy sunshine?

Humans could be the voyageurs—the transporteers—carrying mail and slow philosophical discussion among the water sapients, who will only be grateful for the service, of course, never jealous. Our great-to-the-*n*th grandchildren will have their adventures, and in so doing serve to tie the galaxy together.

It sounds like a way to give both sides in our great debate what they want, without having to have a dangerous, malign universe that's apparently out to get us.

I promised to end on a note of optimism, and I cannot do any better than that.

Now, if only it were true. ■

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● If you are attempting the impossible, you will fail. Jerry Buchmeyer

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a calendar of analog upcoming events

3-7 July
WESTERCON 38 (West coast SF conference) at Red Lion Inn, Sacramento, Calif. Guest of honor—James P. Hogan, Fan Guest of Honor—Paula Crist, TM—Katherine Kurtz. Art show, hucksters, etc. Info: Westercon 38, 4812 Folsom Blvd., Suite 125, Sacramento CA 95819. (916) 481-8753.

4-7 July
INCONJUNCTION V (Indiana SF conference) at Hilton Hotel, Indianapolis, Ind. Guests of Honor—Marion Zimmer Bradley, Michael Kube-McDowell Fan Guest of Honor—Jim Gilpatrick, MC—Juanita Coulson. The usual plus a play by the "It's Not Our Fault" Players. Registration—$15 to 15 June, $20 at the door. Info: InConjunction, Box 19776, Indianapolis IN 46219.

5-7 July
EMPIRICON 6 (NYC-area SF conference) at Sheraton Inn at LaGuardia, NYC. Info: Empiricon, c/o TESSFA, Inc., Box 682, Church Street Station, New York NY 10008.

12-14 July
ARCHON 9 (St. Louis area SF conference) at Henry VIII Inn and Lodge, St. Louis, Mo. Guest of Honor—R. A. MacAvoy, TM—Suzette Haden Elgin. Registration—$15 until 1 June. Info: Archon 9, Box 50125, Clayton MO 63105.

13-14 July
SUNBURSTCON 85 (Tacoma area SF conference) at Sherwood Inn, Tacoma, Wash. Guest of Honor—Judson Scott, Guests—Vonda N. McIntyre, Bjo Trimble. Registration—$20 at the door. Info: Joyce Bakken, Box 44143, Tacoma WA 98444.

19-21 July
MAPLECON 7 (Ottawa area SF conference) at Carleton University, Ottawa, Ont. Comics Guests of Honour—Wendy and Richard Pini. Registration—C$15 to 30 June, C$20 at the door. Info: Maplecon 7, Box 3156, Stn. D, Ottawa, Ontario KIP 5K0 Canada.

19-21 July
UNICON 10 (Maryland SF conference) at Sheraton Inn of Washington, Silver Spring, Md. Guest of Honor—Michael Shea, Art Guest of Honor—Val Lakey Lindahn. Art show, etc. Registration—$10 until 30 June, $15 thereafter. Info: Unicon, Box 263, College Park MD 20740. Include S.A.S.E.

20-21 July
MICROCON (Tucson SF conference) at Holiday Inn Broadway, Tucson, Ariz. Round-robin SF story activity plus video workshop, costuming, etc. Registration—$10. Info: Microcon, c/o Patrick Connors, Box 42036, Tucson AZ 85733.

26-28 July
CON-VERSION II (Alberta area SF conference) at Carriage House Inn, Calgary, Alta. Guest of Honour—Poul Anderson, Fan Guest of Honour—Mary-Karen Reid, TM—Frank M. Robinson. Registration—C$15 until 12 July, C$20 at the door. Info: Con-Version II, Box 1088, Stn. M, Calgary, Alberta T2P 2K9 Canada.

30 August-2 September
NASFiC 1985 (North American SF Convention, officially The First Occasional Lone Star SF Convention & Chili Cook-off) at the Hyatt Regency Austin and Palmer Auditorium, Austin, Texas. Guest of Honor—Jack Vance, Artist Guest of Honor—Richard Powers, Fan Guest of Honor—Joanne Burger, TM—Chad Oliver. Registration—attending $35 until 31 December 1984, then $45; supporting—$15. Info: MASFiC, Box 9612, Austin TX 78766.

—Anthony Lewis

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on gaming

Dana Lombardy

Dave Drake's novel about mercenaries fighting the wars of the future in distant galaxies has been turned into a board game. *Hammer's Slammers* is an SF war game about Colonel Alois Hammer's mercenary regiment of that name ($17.00 at your local store, or direct from Mayfair Games Inc., P.O. Box 5987, Chicago, IL 60680).

As a licensed production, Mayfair's game is faithful to the book published by Ace, and includes sections reprinted from Drake's book.

The evolution of tanks—from the crude behemoths used against trench lines in World War I, to the fusion-powered, air-cushioned mobile super tanks protected by iridium armor—is explained in the forward to the game. Guided missiles are still a great threat to tanks of the future, but satellite reconnaissance, computer fire control, and powerguns are able to neutralize most missile launchers or flying missiles long before they come near their intended targets.

Small groups of infantrymen, armed with short-range anti-tank rockets, are usually contained by radar-detonated anti-personnel mines attached to the tanks and directed precisely to the area of threat. Even if these small, hand-held rockets hit, they're usually too small to destroy a tank with just one hit.

The super tanks of the future dominate the battlefield, are able to range across continents in days, and are big enough to carry sufficient weaponry and sensors to fight successfully against any conventional force they encounter. The only drawback to these almost indestructible armored vehicles is their high price. But Colonel Hammer paid for the best—tanks as well as men.

Mercenary units, called "companies," came into being in the late Third Millennium in response to and as a result of the empire building struggles of the industrial giants of the human-populated galaxy. Many poor, exploited colony planets squandered their precious resources on prestige cities and expensive starships. These problems exacerbated social and racial tensions on the colony planets, resulting in anti-government rebel movements. Such internal fighting made the colony planet less valuable to the homeworlds attempting to control them and to exploit their resources. Hiring mercenaries to subdue unruly planets, or to bring a wayward colony government back to its "senses," seemed a logical alternative to lengthy diplomacy.

Mercenary units were usually better equipped than the colony planets' armed forces which had to get by with more conventional type tanks, armored cars, and weapons. However, using mercenaries adds new risks to warfare, even to the side employing them.

Mercenary units might suddenly "disappear" at a critical moment, or

(continued on page 105)

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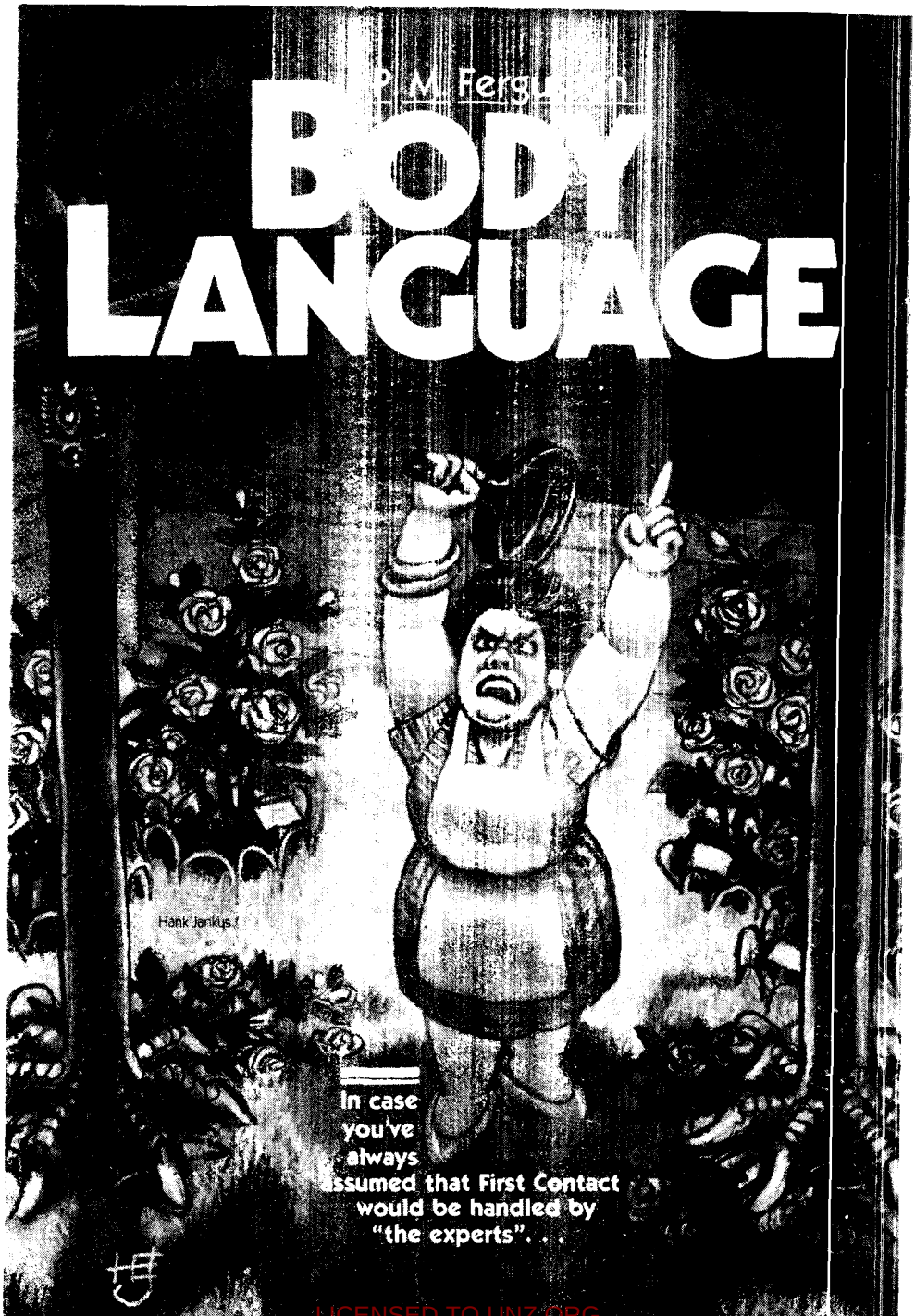
P. M. Ferguson

BODY LANGUAGE



In case you've always assumed that First Contact would be handled by "the experts"...

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"It is not *polite* to point, Prucilla!" her mother told her, and shook her finger emphatically under Prucilla's impressionable four-year-old nose.

Prucilla's mother was determined that her daughter should grow up a proper lady. The definition of *proper* went largely unexamined by all concerned parties. Like most learning experiences it was a try-it-and-see-if-it-works situation. If it doesn't—it isn't proper.

Prucilla, being eager to please, was quite impressed and took the finger shaking lesson to heart. It wasn't acceptable behavior to point but shaking your finger was allowable.

Almost.

When she shook her finger at her brother, her parents laughed. The first time she tested her new found skill on her father, she received a spanking that further qualified the allowability of finger shaking.

Peers and juniors were fair game; parents and others in positions of authority were not.

Like Prucilla in her formative stages, Kreel was a particularly well behaved young larva. There were indications that he would grow to be an equally well mannered adult—for a Gnarth, that is.

The indications were correct, the mannerly habit was carried through his pupal and imagio phases and well into the molts of young adulthood. His antennae were always properly angled and his great hollow feeding claws were always discreetly folded into the grooves in his thorax. Rather than keeping them fully concealed by their protective flaps, they were held unobtrusively visible, indicating respectful willingness should he be requested to assist a fully matured adult in joining the ancestral overmind.

As a result of such polite mannerisms, he was quite welcome at many adult gatherings.

His welcome among his more typically rowdy peers was noticeably less warm. They gave him the nickname of Cool Grool (The Gnarthian equivalent of Wet Blanket). It bothered him, but only slightly. Kreel much preferred adult company.

Among his peers he was expected to be innovative—or at least moderately interactive. Among adults, on the other hand, his manners got him by. After all, juveniles are not expected to be intelligent by comparison to adults. This was fortunate for Kreel—overly intelligent he wasn't.

"Oh shit! Here comes Old Shaky Finger!" Prucilla's brother glared in disgust at his approaching sister. Unobtrusively, he thought, he slipped his companion the pack of cigarettes to get rid of, while he headed off his sister.

Very little was sufficiently unobtrusive to escape Prucilla's ever-questing sense of propriety. He was far too late with the maneuver. Prucilla's shoulders were set, her jaw was thrust, and the trademark finger was upraised and ready.

"Kenneth! *You've* been smoking!" A not entirely true statement. Prucilla arrived before light-up had actually taken place, but intent was adequate grounds for verbal assault in her eyes. "Father will ground you for a month when he finds out." The finger quivered, as if trying to decide direction and emphasis.

"Says who, Pru?" The two boys

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grinned and nudged each other over the brilliance of the rhyme.

Indecision gone, the finger shook in menace. "Don't you make fun of me, Kenneth! You know smoking is for adults—not," Prucilla smiled in triumph and delivered her ultimate insult, "for twelve year old children!"

"How's Dad gonna find out—even if we were smoking, which we weren't —unless you tell him!" her brother's finger stabbed, parry in octet, past her shaking digit. "If you do I'll get even."

"Don't point! It's unmannerly to point!" Prucilla fluffed her indignity into a high dudgeon. "You *threatened* me too! You'll be sorry! Father will ground you forever."

His error realized, Kenneth attempted to mollify his outraged sister. "Aw, Prucilla. I was just joking. You know—"

The attempt was foredoomed. Prucilla gathered her injured sense of propriety about her and stalked off in the direction of home. Her parting comment interrupted her brother and assured her the last-word trophy for the afternoon. "You are a nasty little boy, Kenneth —and you *will* be sorry."

He was. A pack of the forbidden cigarettes and an ashtray were found in the back of his dresser drawer, beneath his winter woolies. He had been framed and he knew it but he was still grounded for a month. It was a lesson learned.

Children are anything but the gentle, cheerful, small adults we would like to believe. Prucilla learned a lesson, too. The handlebars on her bycycle came merrily adrift just as she jounced over the bump near the bottom of Disaster hill. She was fortunate to survive the resultant end over end crash with nothing more serious than cuts, abrasions, and several luminous contusions.

The teaching method had been drastic but the lesson was firmly imbedded, along with bits of road gravel, beneath her scalp. If you are going to set someone up—don't advertise. She settled a resolve comfortably into place: a resolve to be far more circumspect in the future.

Her brother and his cronies soon changed her nickname to Sneaky Finger.

Kreel may not have been overly bright, and was a positive zero at anything creative, but he had a gift for memorization. As his manners copied those of his elders, so his scholastic output copied their thinking. Egotism being a universal vice, Kreel graduated with honors from the middle levels of Gnarthian education.

He immediately applied for, and received, the opportunity to test those same principles that had carried him reliably, so far, on Gnarth's equivalent of a university. To his satisfaction the results were even more gratifying. His grades were stellar and his professors complemented him on his astuteness and invited him to afternoon hivings.

His peers continued to regard him as Cool Grool and went so far as to add the further invective of "spiracle palp," Gnarth's version of brown-nosing. After the first freshman molt his name was removed from the list of those invited to undergraduate tube swarms.

That was fine with Kreel. "I much prefer the faculty hive assimilations anyway, he told himself—and almost believed it."

* * *

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"Bev, are you sure The Finger didn't overhear our plans to sneak out last night?" The speaker was nursing a bruised ego and a two week restriction to dorm—including the indignity of a sweat-socked Amazon escort to and from classes.

"I just don't see how she could have, Kay," her equally restricted friend replied. "We didn't discuss it outside this room—and checked the halls first to boot."

"So how come the Pickled Virgin laid the clamps on us just as we were getting into the Sigma's car?"

"I don't know!" Bev's voice slurred as she rested her chin in her hands. "I just don't know. Maybe it was dumb luck—her luck, not ours—and she saw us from a window as we left."

The two girls sank into the sighs of gloom.

Prucilla quietly closed the cover of the old furnace pipe and smiled. *Nobody* got away with back-talking *her*. "The Finger, indeed." she snorted. She would see that the dorm's resident supervisor was made aware of the appelation *Pickled Virgin*—and *who* was applying it. Prucilla's finger wagged rhythmically in pleasure.

By the time Prucilla met Arnold Walford, in her junior year, her nickname had been further shortened to simply "Finger."

"Arnold! You *listen* to me!" The finger was whipping front to back in aggravated syncopation. "Your mother can wait another two days for her tax returns to be prepared. My father went to no end of trouble to get us invited to this party and I will *not* have it wasted."

Prucilla scrunched herself solidly into the cushions of the parlor couch, like a linesman readying for the snap. "If Dale Arnsbarker likes you, you can go to work for his firm as a customer's man and avoid spending years as a stock runner or a floor man. As you well know, the brokerage business is chancy at best and unless a senior partner likes you, you'll never get a decent clientele."

Arnold attempted a "But, Prucilla" when she paused for a breath.

Breath reloaded, she snapped, "But, Prucilla nothing. I will not marry a pauper with no prospects. Your mother will just have to wait!"

Arnold didn't consider an MBA from Harvard a no prospect situation, and his mother was anything but paupered—that tax statement he was working on showed a six figure income—but he just couldn't figure a way around that finger to tell Prucilla so.

"Arnold! Are you listening to me?"

"Yes, Prucilla. I—"

"Good! And?"

Arnold sighed in defeat. "I guess mother can wait a few days."

Prucilla allowed herself a brief gloat. Arnold might be a mouse, but he would be a rich one if she had her way—and there would be just one cat to lap the cream.

Arnold's mother was too much like Prucilla in taste and method. Prucilla had decided long ago that there was room for only one dominant female in Arnold's life—and she was going to be *it*. She was *not* about to tolerate Mamma's blue wigs and feather boas shedding into her bowl of cream.

Perhaps a nice home for Mama, she thought. In California? Anywhere! Just so long as it was far away from her and

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Arnold. Maybe even a quiet commitment if Mama proved difficult.

The problem was neatly solved by Mama herself. She died, quite unintentionally, of an overactive imagination complicated by ingrown self deceit, one week before Arnold received the coveted MBA.

Arnold was devastated.

Prucilla considered it a *lovely* graduation present, and dropped the partially completed commitment forms into a convenient trash-masher.

After a decent time—Prucilla was very insistent that all proprieties should be observed—she and Arnold were married. Discreetly, of course.

By the time they were married, Arnold was achieving a reputation as a conservative and successful broker with a stolid but respected portfolio. Arnold's clients weren't getting rich on his advice—they already were wealthy for the most part—but they were increasing their money at a steady rate. And, they knew, their investments would continue to profit them long after the plungers and *their* advisors became familiar faces in local soup kitchens.

It was such a proper arrangement, Prucilla thought: Arnold advised his clients and she advised Arnold. The finger had hit its stride. Arnold was a reliable target and, if it needed a challenge or two, there were always paper boys, shop clerks, service people, and the roses.

Roses were a longtime habit of Prucilla's. Her parents had had a garden with several varieties. It was only proper that when she and Arnold purchased a house it would have a rose garden. It was her pride and joy.

"How are my lovelies today? Aphids—oh dear." The dusting can appeared and—poof, puff, poof!—aphids, ants, lady bugs, and other assorted fauna littered the carefully tilled earth.

"You aren't blooming as vigorously as you should!" The finger whipped into action and the offending specimen was subjected to the chiding digit. "And I just fertilized you! If you don't show some improvement . . ."

On and on it went: voice berating, finger keeping time. All in all, Prucilla found it a most satisfactory life.

Kreel was lost. Why, he asked himself in frustrated self-pity, should he of all people rent a ship that had a faulty navigation computer? Galactic navigation computers weren't supposed to be faulty. They were supposed to be reliable. Accurate and reliable. All that was supposed to be required was that you looked up the coordinates of your location and your destination and punched them into the computer. The apparatus was supposed to do the rest.

That arrangement was eminently satisfactory to Kreel.

He was most adept at looking things up and punching numbers.

He was not adept at fixing the things into which he punched numbers, or anything else for that matter, when they went awry.

Now, he lamented, this stupid computer—probably serviced by one of my idiot swarm mates—has landed me Goolach knows where.

It never occured to Kreel that one of those swarm mates he was so adept at up-clawing had indeed serviced his nav-

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igation computer—most carefully, in fact.

A bit of basic observation—a moment of work with a hand computer—and Kreel would have been able to deduce his current coordinates closely enough to make a jump which would have brought him within hailing distance of a service facility. That, however, would have also required a slight amount of adaptive thought on Kreel's part. Not his strongest ability.

Kreel continued to lament and berate for some time before finally deciding to do a visual jump to the nearest system and look for a service station—or anyplace he could ask directions.

Kreel jumped.

The system displayed low tech life—barely out of the chiton and karch wood stage—but perhaps advanced enough to direct him home, even if they couldn't fix his ship.

Kreel jumped for the most promising planetary surface.

His ship came to rest in Prucilla's rose garden.

Prucilla had seen Kreel's landing from her kitchen window. She squalled like a ruptured gerbil. Not in fear—in fury. Prucilla was outraged from the top of her Cosmo-chic coif to the tip of her support hose. Flying saucer—a very large alien that resembled a cross between a tarantula and a praying mantis—it didn't matter. Hell has no fury like a woman who's roses have been squashed, and Prucilla was not the type to leave such an egregious insult to her sense of propriety frolicking about unpunished.

She rushed from the safety of her kitchen, frying pan in hand, tongue cocked and loaded, finger at the ready.

Kreel was at first unsure and startled by this unexpected and enthusiastic welcome. The creature was actually offering him iron—a rather rare commodity on Gnarth. And, could he be mistaken? No, the antenna was waving in the distinct singular fashion. But a non-Gnarthian species? His up-brain diddled his down-brain and reached a tentative conclusion. He was stunned into immobility by the potential honor. He must make sure. He began the proper response wavings of his own antennae.

Prucilla was in fury that exceeded any previous performance by several magnitudes. First her roses were mangled, then her best frying pan had simply disappeared, right out of her hand. She had swung at the creature and he had touched it with some greenish light and—it was gone. Now the thing just stood there and waved those stupid looking antennae at her.

"See here you freak. I don't care where you're from—get out of my rose garden and give me back my frying pan." She was spluttering so loudly that neighbors, who had retreated to the nearest closet for a session of recreational and recuperative thumb-sucking when Kreel had first landed, regained some degree of minimal courage and maximal curiosity, and began to peer out of windows.

Prucilla prepared to pick up the pace. One hand clenched into a rigidly held fist. The other, stuffed under Kreel's lower palps, carried its finger into battle. The finger responded to the chal-

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lenge by waving at a rate never before witnessed by man or Gnarth.

Kreel stared in pride at the furious Prucilla. It was an unbelievable honor. He could scarcely believe such fortune, but there could be no mistaking the ritual signals. One antennae was waving in the code of passing, the other was coiled in the tight ball of unity. This alien actually wanted lowly Kreel to be the instrument of its joining the overmind.

He could not refuse. Kreel's feeding claws flashed out, the razor tips piercing Prucilla's chest on either side of the sternum. Prucilla shrieked—writhed violently for a moment—and slumped. The finger, still extended, nevermore to wave.

The taste was vile but Kreel kept about his task until the last physical juices were drained and the spirit was freed. He was determined to uphold the honor of Gnarth.

Foul flavor, writhing, the slump; he struggled through it all. The honor of Gnarth was secure. Now perhaps he could get directions home. He hoped no others of these soft beings would ask for his aid in joining the overmind. He didn't think he could stand the taste again.

Arnold had watched the entire scene from the parlor window. He had seen Kreel exit the ship, noted his postures. He had seen his wife's attack on the alien and observed its response. His mind made a quantum leap—he accurately guessed, within reason and allowing for differing cultural concepts, what had happened. It was Arnold's moment for glory.

He could be the first to bridge a gap between the stars.

He could properly introduce a starfaring race to man and open the galaxy.

He fainted.

A neighbor with more fundamental ideas, and less acute observational powers, settled the introduction with an express rifle he had purchased for a safari several years previously. A fifty eight caliber soft point, traveling at 600 meters per second, will do an amazing amount of damage—even to a seven foot chitonous alien.

Kreel never knew what joined him to a slightly disgusted overmind.

In proper course, the government confiscated the ship, examined and analyzed it, and sent an expedition to the stars. After fixing the nav computer, of course. It was called the heroic enterprise of the century.

It carried a select crew, commanded by an overage astronaut who had lost his last bid for election to Congress. The personnel who backed him had been carefully chosen by a committee of experienced bureaucrats.

It was an uncharacteristically wise selection. The attitudes among the crew members ranged from sheer cowardice to abject caution. They would be deferentially polite to anyone they chanced to encounter—if they encountered anyone—which they fervently prayed they wouldn't.

On their second jump toward advanced insecurity, the borrowed ship appeared, with an inaudible plop, in Gnarthian space.

The Gnarth detected the ship, recognized it, scanned its strange occu-

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pants, instantly deduced (with the assistance of the overmind, less the still traumatized Kreel who had found a quiet mind-cell and was energetically palping his claw) the course of preceeding events, and welcomed the Terrans with open antennae.

All in all, it was a most properly auspicious beginning.

AFTERWORD

The late Prucilla Walford was enshrined as one of the nation's great heroines, along side Betsy Ross, Molly Pritcher, Grace Kelly, and Gloria Steinem.

Recently, a number of miracles have been attributed to her and a movement for canonization has gained enormously in momentum. A side effect of this movement has been to give Pope Pius-John-Paul a severe migraine. However, in view of Prucilla's busy schedule of heavenly bridge games and rose society meetings, frequently in the company of Arnold's late mother, the truth of such reported miracles is highly suspect. ■

ON GAMING

(continued from page 96)

switch sides for a well-timed bribe. If not paid promptly, a mercenary unit could be an even greater enemy than it is when fighting as an ally.

Mercenaries also take many risks, in addition to the normal ones inherent in battle. They might be massacred by an employer who wants to avoid payment. Mercenaries might also be abandoned on a distant planet when their usefulness is gone, or a political "deal" is negotiated with them as an expendable "pawn."

To prevent chaos, the banking firm of Felchow and Sohn becomes the broker or escrow house for employing mercenary companies, making sure they are paid (and the bank receives its service "fee"), and that the mercenaries fulfill their end of a contract. Eventually, a Bonding Authority comes into existence, managed independently of the banking cartel.

A typical turn is played as follows: the player who gets to move first attempts to rally his disrupted units (if any); he may then attempt paradrops or counter-paradrop fire; he may then move his units; both players may then conduct combat, with direct-fire weapons (shooting at what they can "see"), and indirect fire weapons (such as artillery shooting at targets out of visual range); finally, both players may make close assaults (a simultaneous battle fought to the death by enemy units in the same hex). These five steps are repeated by the other player who moves his units next, and after both players have completed their five steps, a turn is over.

Hammer's Slammers is a straightforward tank warfare game. Gamers familiar with World War II armored combat simulations will have no trouble learning how to play this game—the only difference is the far future setting and the improved weapon systems.

What makes this game work are the scenarios. Some are not very challenging, but several are excellent. There are simple, short battles using just one small section of the game boards provided, and large engagements, with dozens of counters on each side.

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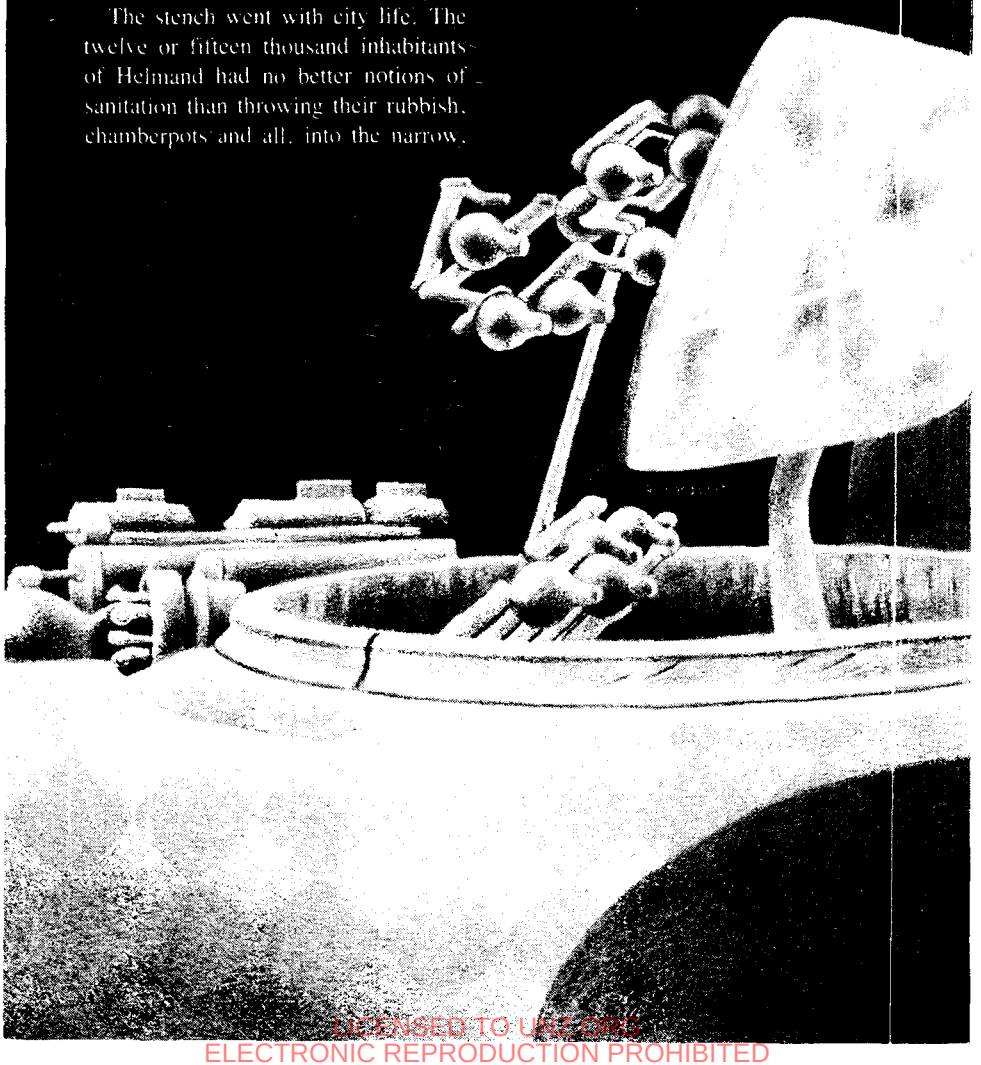
Sun, stench, racket: market day at Helmand.

The sun was a G-0 star, not much different from Sol. Asked to generate a name for it, the computer called it Bilbeis. It blazed in the blue cloisonne dome of the sky. Beyond the Margush river and the canals that drew its water for the croplands of Helmand and the other river valley towns, the land was a desert, baked brown and bare.

The stench went with city life. The twelve or fifteen thousand inhabitants of Helmand had no better notions of sanitation than throwing their rubbish, chamberpots and all, into the narrow, winding streets. After a few years, the floors of their dwellings would be thirty or forty centimeters below street level. Then it was time to knock down the whole house, and a new mud-brick structure would go up on the rubble. Helmand perched on a hill of its own making, a good fifteen meters above the Margush.



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As for the racket, expect nothing else when large numbers of people gather to trade, as the folk of Helmand did once a nineday. And they *were* people. Only by such details as skin and hair color, beard pattern, and shape of features could they be told at a glance from Terrans. There were more subtle internal differences, but David Ware and Julian Crouzet had no trouble passing as foreigners from a distant land.

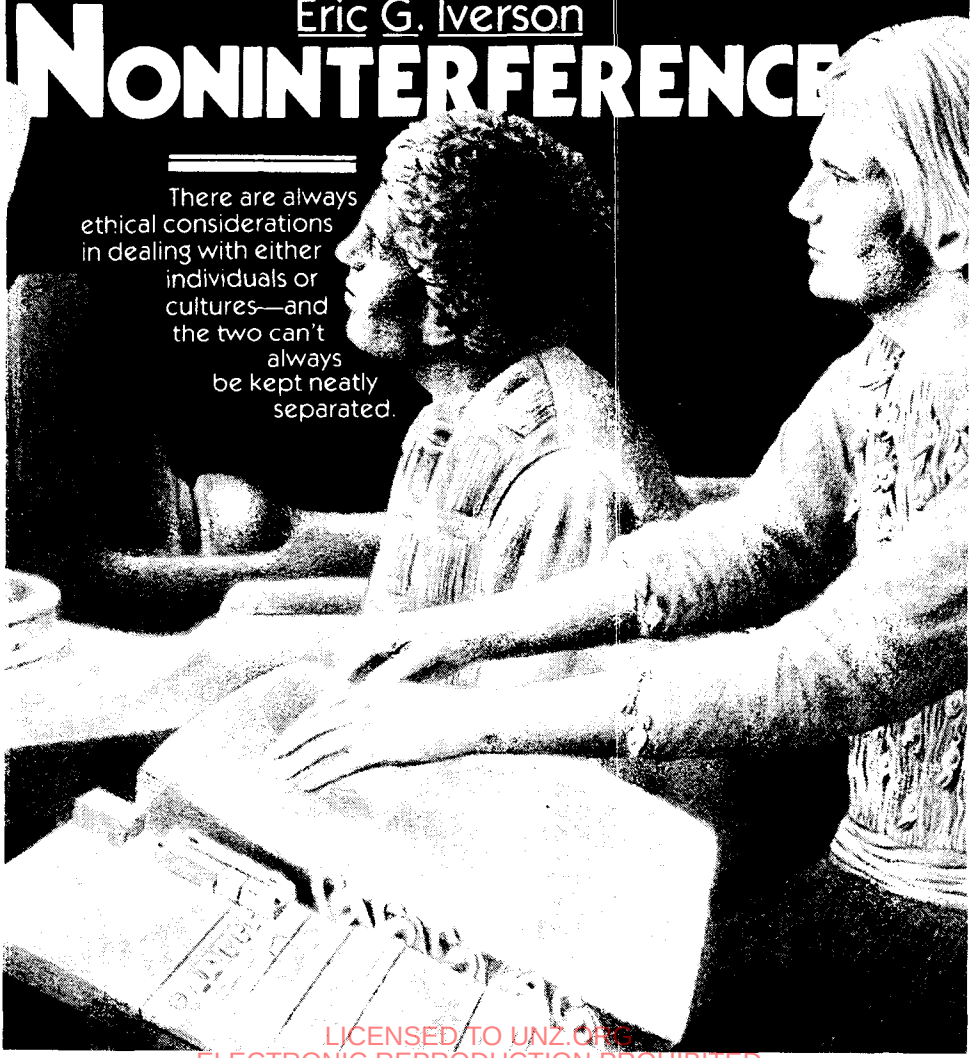
The two Survey Service anthropologists strolled through the marketplace. They gratefully paused in the long shadow of a temple for the time it took to drink a cup of thin, sour wine.

In their boots, trousers, light pullovers, and caps, they attracted some at-

Eric G. Iverson

NONINTERFERENCE

There are always ethical considerations in dealing with either individuals or cultures—and the two can't always be kept neatly separated.



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tention from the people swarming round them, but not much. The city dwellers were already typical urban sophisticates, though Helmand and the other towns of the Margush valley represented the first civilization on Bilbeis IV.

Most of the stares came from peasants, in from the fields with produce or livestock to trade for the things they could not make themselves. Here a farmer weighed out grain to pay for a new bronze sickleblade, there another quarreled with a potter over how much dried fruit he would have to give for a large storage jar. The latter man finally threw up his arms in disgust and stomped off to find a better deal.

David Ware had been taping the argument with a camera set in a heavy silver bracelet. "You think that one's unhappy," Crouzet murmured, "look at the trader over there."

The fellow at whom he nodded was from the Raidan foothills west of the Margush. He let his gray-green mustachioes grow barbarously long, and wore a knee-length tunic of gaudy green and saffron stripes. "You try to cheat me, you son of a pimp!" he shouted in nasally accented Helmandi, shaking his fist at the fat stonecutter who sat cross-legged in front of his stall.

"I do not," the stonecutter said calmly. "Seventy *diktals* of grain is all your obsidian is worth—more than you would get from some."

The hillman was frantic with frustration. "You lie! See here—I have three beastloads of prime stone. In my grandfather's day, my animals would have killed themselves hauling the grain that stone brought back to my village. Seventy *diktals*—faugh! I could carry that myself."

"In your grandfather's day, we would have used the obsidian for sickles and scythes at harvest time, and for edging warswords. Bronze was hard to come by then, and even dearer than stone. Now that we have plenty, we find it more useful. So what good is your obsidian? Oh, I can make some of it into trinkets, I suppose, but it is no precious stone like turquoise or emerald. The jewelry would be cheap, and move slowly."

Ware turned away with a half-amused, half-cynical snort. "Even in a Bronze Age society, changing technology throws people out of work."

"That's true at any level of culture," Crouzet said. "I will admit, though, that the pace has picked up in Helmand under queen Sabium."

"I should say so." Ware's craggy face was normally rather dour, but lit now with enthusiasm. "She's one in a million."

His companion nodded. As if summoned by the mention of their ruler, a platoon of musicians marched into the square down the one real thoroughfare Helmand boasted: the road from the palace. They raised sea-shell trumpets to their lips, blew a discordant blast. The two Terrans winced. The market-day hubbub died away.

"Bow your heads!" a herald cried. "Forth comes Sabium, vicegerent of Illil the goddess of the moons and queen of Helmand." Actually, the word the herald used literally meant "lady king"; Helmandi had no exact equivalent for "queen," as Sabium was the only female ruler the town had ever known.

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Fifteen years before, she had been principal wife of the last king. When he died, his firstborn son was a babe in arms, and Sabium administered affairs as regeant. The town prospered as never before under her leadership. A few years later, the child-king died too. Sabium ruled on, now in her own right, and did so well that no one thought to challenge her.

"I wonder what brings her out," Crouzet said, his eyes on the dirt. "She's missed the last couple of market days."

"I didn't think she looked well, either, when she was here," Ware nodded.

The royal bodyguard preceded the queen into the square. The troopers carried bronze-headed spears and maces with wicked spikes. They used their big leather shields to push people out of the way and clear a path to the raised brick platform in the center of the marketplace.

A retinue of Helmand's nobles followed. The hems of their long woolen robes dragged in the dust; their wide sleeves flapped languidly as they walked. Not for them the bright colors that delighted the semi-savage obsidian seller: like the bodyguards and most Helmandis, they preferred white or sober shades of brown, gray, blue. But gold and silver gleamed on their arms, round their necks, and in ear and nose rings.

A sedan chair borne by twelve husky servants brought up the rear of the procession. David Ware whistled softly when he saw it from the corner of his eye. "I'll bet she is sick, then!" he exclaimed. "She always walked here before."

"We'll know soon enough," Crouzet said calmly. He was a big, moonfaced man; his phlegmatic nature made him a good foil for Ware, who sometimes went off half-cocked.

Skillfully keeping the sedan chair level, the porters carried it to the top of the platform, set it down, and scurried down the stairs. The white-robed priest of Illil who had accompanied them stayed behind. The shell-trumpets blared again. The priest drew back the silk curtain that screened the interior of the sedan chair from view.

"Behold the queen!" the herald shouted.

The crowd in the marketplace raised their heads. Ware lifted his arm, as if to scratch, so he could record Sabium's emergence.

He tried to suppress the involuntary gasp of surprise and dismay that came when he saw her, but could not. It hardly mattered. The same sound came from Crouzet beside him, and from the throats of everyone close enough to Sabium to see how ill she truly was.

A month before, Ware thought, she had been a handsome woman, even without making allowances for the differences between Terran and Helmandi standards of good looks. Her pinkish-gray skin, light blue hair that receded at the temples, and downy cheeks seemed no more strange, after one was used to them, than Crouzet's blackness or his own knobby-kneed, gangly build. Even the false mustache she wore to appear more fully a king somehow lent her face dignity instead of making her ridiculous.

Her strength of character was responsible for that, of course. It shone through

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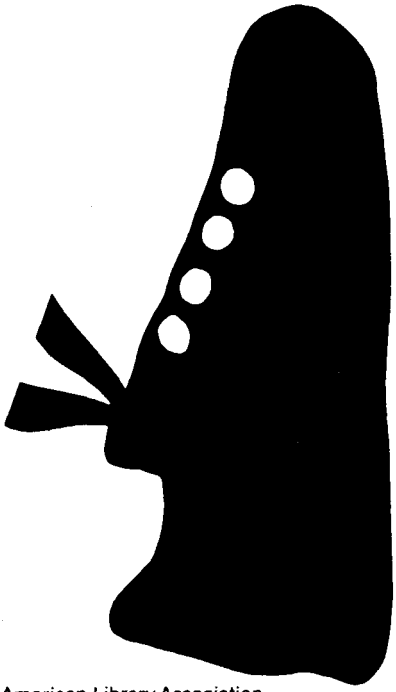

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her violet eyes like sun through stained glass, animated her aquiline features. One could hear it in her clear contralto, see it in the brisk grace with which her stocky body moved. No wonder the whole city loved her.

Now she got out of the sedan chair with infinite care, as if every motion hurt. She had to lean on the priest's arm for a moment. Her body seemed shrunken within the heavy, elaborately fringed robe of state, shot all through with golden thread. She held the royal crown—a massy silver circlet, encrusted with river pearls and other stones that glowed softly, like moonlight—in her hands instead of wearing it. Her face was more gray than pink.

"My God, she's dying!" Ware blurted.

"Yes, and heaven help Helmand after she goes," Crouzet agreed. The one thing Sabium had not done was provide for a successor. Probably, Ware thought, she was too proud to admit to herself that her body had betrayed her.

She could still force it to obey her for a time, though, and carried on with the ceremony as if nothing were wrong. Her voice rang through the square: "Shumukin son of Galzu, ascend to join me!"

A small, lithe man climbed the steps, went on his knees in front of the queen. Sabium declared, "For the beauty of your new hymn to Illil, I reward you with half a *diktal* of refined gold and the title of *ludlul*." The rank was of the lesser nobility; Shumukin went down on his belly in gratitude. The trumpeters at the edge of the square struck up a new tune, presumably Shumukin's hymn.

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The crowd applauded. Shumukin rosé, smiling shyly, and stepped to one side.

There was a visible pause while Sabium gathered herself. The priest spoke to her, too softly for the Terrans to catch. She waved him aside, called out, "M'gishen son of Nadin, ascend and join me!"

This time the Helmandi was old and stout, and leaned on a stick going up the stairs. The priest held the cane as he clumsily got to his knees. Sabium said, "For sharing what you have learned with all of Helmand, I reward you with three *diktals* of refined gold and the rank of *shaushludlul*." That was a higher title than the one Shumukin had earned. M'gishen prostrated himself before the queen.

Sabium bent to bid him rise, and could not hide a wince of pain. "Tell the people of what you found."

Shifting from foot to foot like a nervous schoolboy, M'gishen obeyed. His thin, reedy voice did not carry well. He had to start over two or three times before the calls of "Louder!" stopped coming from the back of the marketplace.

"Everybody here knows what a taper is, of course," he said. "You take a wick and dip it in hot tallow. Well, if you dip it again and again and again, more and more tallow clings, y'see. When you light it then it gives off a real glow like an oil lamp, not just a little tiny flame. Lasts as long as a lamp, too, maybe longer. Eh, well, that's what it is." He reclaimed his stick and limped down the steps.

"Rewards await anyone who learns something new and useful and passes on his knowledge, or who shows himself a worthy poet or sculptor or painter," Sabium said. "I set aside the first morning of every nineday to judge such things, and hope to see many of you then."

"Amazingly sophisticated attitude to find in such a primitive society," Crouzet remarked.

"I'm sorry, what was that?" David Ware had been watching the priest of Illil help Sabium back into the sedan chair. The process was slow and agonizing; he could see her bite down hard on her lower lip to distract herself from the other, greater, torment. It was a relief when the silk draperies gave her back her privacy.

Crouzet repeated what he had said. "Oh, yes, absolutely," Ware agreed. "For this sort of culture it's better than a patent system; the bureaucracy to run anything like that won't exist here for hundreds of years. But the up-front reward encourages people to put ideas in the public domain instead of hanging onto them as family secrets."

"To say nothing of spurring invention." Crouzet's eyes followed the servitors bearing Sabium back to the palace. "What do you think the odds are of whoever comes after her keeping up what she's started?"

Ware laughed without humor. "What's the old saying? Two chances —slim and none."

"I'm afraid you're right. There are times when the rule of noninterference is a shame." Survey Service personnel on worlds without spaceflight were strictly observers, doing nothing to meddle in local affairs.

When Ware did not reply at once, Crouzet turned to look at him. His col-

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league's face was a mask of furious concentration. Crouzet was no telepath, but he did not have to be to know what the other Terran was thinking. Alarm replaced the black man's usual amused detachment. "For God's sake, David! There's never justification for breaking the noninterference rule!"

"The hell there isn't," David Ware said.

Lucrezia Spini played the tape of queen Sabium in the marketplace for the fourth time. "Yes, it might be a malignancy," the biologist said. "If I had to make a guess just from seeing this and from the speed of the illness' advance, I'd say it could well be. But making a real diagnosis on this kind of evidence is pure guesswork. There are so many ways to fall sick, and on a world like this we'll only learn a tiny fraction of them."

"What can you do to pin it down more closely?" Ware asked. A flyer had brought him and Crouzet back to the *Leeuwenhoek* the night before. They had summoned the machine to a field several kilometers outside Helmand. It was silent, and local fear of demons who dwelt in darkness made the chance of being observed vanishingly small. The *Leeuwenhoek* itself had landed in the northern desert, safe from detection.

Spini rubbed her chin as she thought; had she been a man, she would have been the type to grow a beard for the sake of plucking at it. At last she said, "I suppose I could sneak a small infrared sensor onto the roof of the queen's bedchamber and do a body scan. If there are tumors, they'll show up warmer than the surrounding normal body areas."

"Would you?" Ware tried to hold the eagerness from his voice. He had kept quiet about his gut reaction back in the marketplace. If Sabium was suffering from some exotic local disease, she would die, and that was all there was to it. If, on the other hand, she had cancer . . . Time enough to worry about that when he knew.

"Why not? Either way, I'll learn something." When the anthropologist kept hovering over her, she laughed at him. "I don't have the answers yet, you know. I have to program the sensor, camouflage it, and send it out. Come back in three days and I may be able to give you something."

Ware had plenty to keep him busy while he waited, but could not help fretting. What if Sabium died while they were investigating? She had seemed so feeble. Ware also noticed Julian Crouzet giving him suspicious looks every so often. He ignored those.

When the appointed day came, he fairly pounced on Lucrezia Spini, barking, "Well?"

She put a hand on his arm. "Easy, David, easy. Anyone would think you were in love with her."

He blinked. That idea had not occurred to him, and he was honest enough with himself to take a long look at it. After a few seconds he said, "You know, I might be, if she came from a civilization comparable to ours. As is, I admire her tremendously. She's kindly but firm enough to rule, she boosts this culture in ways it couldn't expect for centuries yet, she's three times as smart as any of the local kings—and she carries on like a trouper in spite of what

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she's got. Whatever it is, she deserves better."

"No need to preach. I'm convinced," Spini laughed, but he could tell his earnestness had impressed her. "This will interest you," she went on, and fed a cassette into the monitor in front of her.

The screen lit in an abstract pattern of greens, blues, reds, and yellows: an infrared portrait of Sabium's boudoir. "Ignore these," Spini said, pointing to several brilliant spots of light. "They're lamps, so of course they show up brightly. Here, now—"

Yes, the pattern at the bottom might be a reclining figure. "Lucky the Helmandis sleep nude," the biologist remarked. "In this climate it's no wonder, I suppose. Clothes would have confused the picture, though. Look here, and here, and here, and especially here—" Her finger moved to one area after another that glowed yellow or even orange. "Hot spots."

"That's her belly?" Ware asked harshly.

"Full of tumor." Spini nodded. "A classical diagnosis. Too bad, if what you say about her is true. If she were a Terran, I wouldn't give her more than another month, tops, with that much metastatic cancer in there."

"Just how different biologically are the locals, Lucrezia?" Ware said. He hoped he sounded casual.

He must have, for she answered readily: "Not very. When you were in Helmand you ate the food, drank the beer. Some of the desert herbs here synthesize chemicals that look promising as pharmaceuticals."

"How interesting," the anthropologist said.

"No," Senior Coordinator Chunder Sen said flatly. With his round brown face and fringe of white hair, he usually reminded David Ware of a kindly grandfather. Now he sounded downright stern—something Ware would not have imagined possible—as he declared, "The rule of noninterference must be inviolable."

Heads nodded in agreement all around the table in the *Leeuwenhoek*'s mess, which doubled as the assembly chamber. It was the only compartment that could hold the ship's twenty-person complement at once. Julian Crouzet had taken pains to sit as far from Ware as he could, as if to avoid any association with what his colleague was proposing.

"So this is what you were leading up to," Lucrezia Spini exclaimed. It sounded like an accusation.

The anthropologist nodded impatiently. "Of course it was. We ought to cure queen Sabium, as I said when I asked for this meeting. It could be done, couldn't it?"

"Technically speaking, I don't see any reason why not. I already told you that the natives' metabolism isn't much different from ours. With the interferons and other immunological amplifiers we have, we could stimulate her body to throw off the malignancy. But I don't think it's proper that we should. Noninterference has been Federacy policy from the word go, and rightly. Where would we be if more advanced races had tinkered with Terra when we were just a single primitive world?"

"Maybe better off; who knows?"

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Ware said. But he saw at once that he had been too flip. He backed off. "What's the reasoning behind the rule of noninterference, anyway?"

"Oh, really now, David," Jemala Gürsel snorted. The meteorologist went on, "There's no point to treating us like so many children. Everyone knows that." She shook a finger at Ware in annoyance.

"Let's get it out in the open and look at it," he persisted.

"Very well." That was Chunder Sen, sounding resigned. As a bureaucrat, he was vulnerable to appeals to proper procedure. "Julian, do the honors, will you?"

"Gladly," the other anthropologist said, "since a chance comment of mine seems to have touched David off in the first place. There are a great many sound reasons behind noninterference, but the most telling one is the one Lucrezia gave—less advanced cultures deserve to develop in their own way. We have no right to meddle with them."

"That's exactly what I thought you'd say," Ware told him, "and it sounds very noble, but it doesn't bear much relation to reality. The truth is, we interfere every time we come into contact with a local."

"Nonsense!" Crouzet snapped, and that was one of the milder reactions. Coordinator Chunder Sen, a devout Hindu, could not have looked more pained if he had suddenly discovered he'd been eating beef for the last six weeks.

Ware did not mind. He felt filled with a sudden crazy confidence, like a gambler who knows the next card will make his straight, the next roll will be a seven.

"It isn't nonsense," he insisted. "The physicists have known for a couple of thousand years that the act of observation affects what's being observed."

"Don't throw old Heisenberg at us out of context," said Moshe Sharett, the chief engineer. "He's only relevant at the atomic level. For large-scale phenomena, the observer effect is negligible."

"Who says Helmand is a large-scale phenomenon? Ten or twenty thousand people strikes me as being awfully different from the sextillions of atoms chemists and physicists play with."

Sharett scratched at an ear. Several other people frowned thoughtfully. Julian Crouzet, though, said, "I defy you to show me how walking through the streets of Helmand could twist the culture out of shape."

"Even that might. Suppose we bumped into someone and made him late for an important meeting, so a decision was taken that he would have changed if he'd been there? But walking about isn't all we do, you know. Remember that scrawny vendor we bought wine from? The grain we gave him could well have kept him and his whole family from starving. We might have changed a thousand years of bloodlines if a child that would have died grows up to breed."

"Oh, come now," Crouzet said. "If we hadn't bought from him, someone else would."

"Would they? Not many people did, or his ribs wouldn't have shown so clearly, Julian, I'm afraid we did him a good turn, whether we wanted to or not. Let's give ourselves up."

Crouzet threw his hands in the air.

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"Spare me your sarcasm. What if we did? It's a long way from going in and healing queen Sabium."

"I grant you that," Ware said at once, "but the difference is one of degree, not of kind—that's the point I'm trying to make. It's interference either way. For once, let it have a purpose. Here; I'm going to show two tapes and then I'm done."

He walked over to the big vision screen that took up most of one wall. The first tape was the one he and Crouzet had made of Sabium in the marketplace. "Give us a running translation for those who don't know Helmandi, will you, Jorge?" he said. "You're smoother than I am."

Jorge Morales, the ship's linguist, was a self-important little man. He jumped a bit, but did as Ware asked him. The anthropologist nodded to himself. After two minutes of translating, Morales would think any attack on the tape was an attack on him personally.

But there were no attacks. Sabium's courage impressed the company of the *Leeuwenhoek* even more than her wisdom. In the dead silence that filled the messhall, Ware inserted the other tape. "This has two parts," he said. "The first one is from a spy camera I planted in the palace bedroom the other day."

Seen from above, attendants bustled around Sabium. One offered food and drink, most of which she declined. Others helped her take off the stifling royal robes; she accepted that attention with relief, as she did the cloth soaked in cool water that a serving-maid pressed to her forehead.

Some of the water ran down her face and got into her false mustaches, which began to come off. She said something that made her attendants laugh. "What was that?" Moshe Sharett asked.

"Something to the effect that that was one thing her husband hadn't had to put up with," Ware replied. He saw several of the people watching the screen grin; not all of them were those he expected to back him.

After a while the servants bowed their way out, leaving Sabium alone in the chamber, a small, tired woman wearing only a thin shift that covered her to midshift stretched tight across her swollen belly, as though she were pregnant.

If she had not known how ill she was that day in the marketplace, she did now. She pressed herself here and there, and flinched more than once in the self-examination. When she was done, she shrugged and spoke, though she did not think anyone was there to hear her. "Another day gone," Ware translated. "Now to do the best I can with the ones I have left."

Sabium rose, stripped off the shift with an involuntary grunt of pain, and blew out the lamps. The leather thongs supporting the mattress creaked as the bedchamber went dark.

The second piece of tape was the infrared sequence Lucrezia Spini had taken: a death sentence in bright, cheerful, false colors.

"Which is the greater distortion?" Ware asked softly. "To let such a queen as that die prematurely, knowing that nothing she had worked for would survive her, or for her to live out her natural span? That's the choice before us now." He sat down.

Had Coordinator Chunder Sen been a military man instead of an adminis-

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trator, he would never have let it come to a vote. But he was confident of the outcome. The letter of the rule of noninterference was as much an article of faith to him as his belief in Brahma, Shiva, and Vishnu. He could not imagine anyone else having a different opinion.

To his amazement, he lost, twelve to eight.

Ware turned curiously to Julian Crouzet as they walked through the streets of Helmand toward the palace. "Just why are you coming along, if you disagree so strongly with what I'm doing?" he asked.

"Frankly, to keep an eye on you," the other anthropologist replied.

"I'm not going to give Sabium the secret of the stardrive, Julian," Ware said, sighing. "For one thing, I don't know it myself."

"Thank God for small favors," Crouzet said grimly. Ware glared at him, but let it go; they were coming up to the entrance of the palace.

The arched doorway was twice the height of a man. Most of the palace was built of the same sun-dried mud brick as the rest of Helmand, but in the wall that held the doorway expensive fired bricks had been used lavishly, for show. Their fronts were enameled in bright colors, like giant mosaic tesserae. Here a predator was shown leaping on a herd animal, there a hunter's arrow brought down a flying creature. The entrance itself was flanked by a pair of apotropaic gods.

A steward—a low-ranking one, from his unadorned robe and plain white conical hat—approached the two Terrans, asking, "What do you foreigners wish?"

With Crouzet standing by in silent disapproval, Ware launched into the cover story that had been hammered out aboard the *Leeuwenhoek*: "As you can see, we are from a far country. We have done well for ourselves here in Helmand, and we would like to give your splendid city a gift in return. Forgive me if I speak now of intimate matters, but is it not true that your queen is unwell?"

The steward's eyes narrowed. "What if it is?"

"We saw her on her last trip to the marketplace, I and my friend," Ware said, including Crouzet whether he liked it or not. "If her illness is as it appears, it is one for which our people have a cure."

"As what charlatan does not?" the steward said scornfully. "And for your so-called cure, no doubt, you will want all the silver and half the grain in the city—payable in advance."

The Helmandis were very human indeed, Ware thought. He said, "No it is a gift, as I told you. We will heal your queen if we can, and ask nothing for it. Indeed, we will refuse whatever you may offer."

That rocked the toplofty steward back on his heels. "Come with me," he said after a few seconds, and led the Terrans into the palace. Away from the entrance, only torches lit the rush-strewn narrow halls, which smelled of burning fat, stale sweat, and ordure.

Several functionaries, each more important than the one before, grilled the anthropologists. The last barrier before Sabium was the priest of Illil who had

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helped her on the platform. "Do you swear by all your gods that your remedy will cure?" he demanded.

"No," Ware said at once. The natives' metabolism was almost identical to that of the Terrans, but not quite—and there were always individual idiosyncracies. He added, "If it fails, it will do her no harm."

"Well, what is there to lose?" the priest muttered under his breath. Ware did not think he was supposed to hear. Then the local did speak directly to him: "Stay here. I shall take your words to the queen, to let her decide." Spearmen stood aside to let the priest pass, but never stopped watching the Terrans.

The wait could not have been more than ten minutes, but stretched till it seemed like hours. At last the priest of Illil returned. "This way," he said brusquely. Ware gave a sigh of relief and followed, Crouzet at his side.

Something small and nasty buzzed down onto Ware's neck, bit him, and flew away before he could swat it. It wasn't exactly an insect, according to Lucrezia: it had too many legs, and its life-cycle didn't go through the same phases. Close enough for government work, though, the anthropologist thought, rubbing.

Braziers of incense smoked in the small chamber where Sabium received the Terrans, but the sweet, resinous smoke could not quite cover the sickroom odor of the place. The queen reclined on a low couch with a headrest; a rug embroidered with river-flowers covered her legs. The walls of the chamber were white, to help reflect torchlight.

Sabium had grown even thinner, Ware thought as he and Crouzet went to their knees before the queen. Only her eyes, smudged below with great dark circles, showed life. They glowed, enormous, in a face now skeletally lean.

"Rise," Sabium said. She studied the Terrans with an interest still undimmed by illness, commenting, "I remember noticing the two of you in the marketplace once or twice. What distant land do you come from, that grows men of your colors?"

"It is near the great western ocean, your majesty," Ware replied. The Helmandis knew nothing about that part of the continent.

Sabium asked more questions; a scribe took down the answers the anthropologists gave. Only when a spasm of pain wracked her so that her hands twisted and her lips went white beneath her false mustache did she say, "Tupsharru"—she nodded toward the priest of Illil—"tells me your city is skilled in medicine." For all the emotion that showed in her voice, she might have been speaking of the weather.

"Yes, majesty," Ware said eagerly. He drew a stout syringe from the pouch he wore at his belt. He showed her the point, warning, "I will have to prick your arm to give you the medicine. It may hurt you some."

She astonished him by laughing. "What is the sting of a needle against the beast of fire in my middle? Come forward, and fear not; if I were to harm the physicians who failed to cure me, none would be left in Helmand."

She did not flinch when he made the injection, and held her arm motionless until the entire dose had been administered. As she watched the medicine

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enter her, he could see her grasping the principle of the syringe. "Ah, the needle is hollow, like the sting of the *gurash*," she murmured. "That idea might prove valuable in other ways as well."

Ware could feel the weight of Crouzet's sardonic glance on his back, but did not turn around.

"That's all?" Sabium asked when he put away the hypodermic. He knew what was puzzling her: in Helmand, witchcraft and medicine were hard to tell apart, and drugs and elaborate charms went hand in hand.

He shrugged. "Yes, your majesty. To us, that our remedies work is more important than the spectacle involved in using them." She dipped her head thoughtfully, then returned to her questions about the Terrans' fictive homeland.

Before long, yawns began punctuating the interrogation. Lucrezia Spini had warned that drowsiness was a common side-effect of the drugs, and so Ware was more encouraged than not to see Sabium sleepy—if it was a first sign she was reacting as Terrans did. Tupsharru, though, started up in alarm when his queen dozed off in the middle of a sentence.

The priest searched Ware with his eyes as the anthropologist explained that there was no danger. Tupsharru said coldly, "Then no doubt you will not object to staying here in the palace until her majesty returns to herself."

"No doubt," Ware replied, and hoped he meant it.

Although windowless and therefore very stuffy, the room in which the Terrans were confined was well-appointed, and their evening meal fit for a noble: bread, salt fish, boiled leguminous plants, candied fruit, and a wine hardly less sweet. The squad of soldiers outside the barred door, however, did nothing to improve the appetite.

Most of a day went by before the door opened again; Crouzet beat Ware out of a week's pay at dice. They were still crouched over the plastic cubes when Tupsharru burst into the chamber, half a dozen spearmen at his back.

Ware grabbed for the stunner in his beltpouch, but there was no need. The priest of Illil went to one knee before him, as if in salute to a great lord. "She wakes without torment, for the first time in the gods know how many ninedays!" he said exultantly. "And she is hungry, as she has not been for even longer!"

"Well, David, you seem to have pulled it off," Julian Crouzet said, his voice sober. "I hope you're pleased."

Ware hardly heard him; he was too busy trying to be polite declining the gifts Tupsharru wanted to shower on him. At last he did take a couple of fine small bronzes, one a statuette of Illil with a moon in either hand, the other a portrait bust of Sabium that managed to capture something of her character in spite of being almost as rigidly formulaic as the image of the god.

"It would have been out of character for traders to turn down everything," he told Crouzet, a little defensively, as the two Terrans made their way back to the city gate. They had had to argue Tupsharru out of an honor guard.

"No doubt you're right," Crouzet said, and lapsed back into silence.

"You still think I was wrong, don't you?"

"Yes," Crouzet answered promptly.

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Ware thought he was going to leave it at that, but he went on with a sigh, "For better or worse, it's over, and there's nothing I can do about it any more. Maybe it will all turn out for the best in the long run; who knows?"

"Julian, listen to me: in the long run it won't matter at all. No matter what we say, noninterference just isn't that important on a preindustrial world, except as a policy to prevent exploitation. The same discoveries always get made; if not now, then in a few centuries."

"That's not what you were claiming back at the ship," Crouzet remarked.

"You're right, but I wouldn't have gotten anywhere taking that tack. Think about it, though. By the time the next survey ship gets around to Bilbeis IV, in fifteen hundred years or so, who'll remember anything about queen Sabium? The crew will, sure, because they'll have our tapes, but what about the locals? Maybe a priest or two will know of her name, if the Margush river valley civilization survives—maybe not, too. So what, either way?"

Crouzet looked him in the eye. "You, my friend, are talking through your hat. What's more, you know it. You don't have the slightest idea what the effect of this interference is going to be, any more than anyone else does."

"Don't I?" Ware snapped. He sounded very tired. "Whatever it is, it won't be much. This society is as tradition-bound as any other early civilization. If Sabium gets too far out in front of her people, they won't follow her any more, and that'll be that. Or the priests will say her changes offend the gods, and overthrow her. That'll solve your problem, too. You tell me, dammit—am I right, or not?"

Crouzet considered. "Maybe," was all he would let himself say.

To Ware, it was like a concession. "There, you see? What I set out to do was to save a good woman from a lot of anguish and a nasty death, and that's what I did—that's *all* I did. Where's the evil in it? That's what I want to know."

They walked on a while in silence, but not an angry silence, as before. Then Crouzet sadly said, "Oh, David, David, David," and put his arm around the other anthropologist's shoulder. "Justify it any way you like. When we get home, the review board will crucify you all the same, not least for playing on everyone's emotions so shamelessly."

"Let them," Ware said. "For my money, it's worth it." The walls of Helmand loomed ahead, close now. He began to whistle. ■

● You must make science your own to properly understand and love it. Science must play like music in your mind—music about to be composed, order about to be grasped and stated.

George Zebrowski,
"Herding Words: A Journal"

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The Alternate View

THE TECHNOLOGICAL PROBLEM GAME II

G. Harry Stine

In the Mid-September 1983 issue, I invited readers to participate in a noncompetitive activity entitled "The Great Technological Problem Game." Since I know that I don't write deathless, unforgettable golden words, let me briefly review the purpose and rules for those who may have forgotten that issue:

I asked the question: "What, in your opinion, is the most important problem that technologists should tackle in the next twenty years, and why do you believe this?"

Answers were to be legibly typed or written in 500 words or less, and no more than two double-spaced typewritten pages at most. There was no deadline to meet. The Editor and I would review the most interesting ones and report to you in a future issue.

This is that issue.

I don't know why I was surprised by the results. Perhaps I was kidding myself into believing that those among the readership who cared enough to participate were educated to the point where they would play the game by following the rules, be able to write a simple declarative sentence in the English language, and have spent enough time thinking through their position to be able to state it in 500 words or less.

A total of 127 replies were received over a period of time from September 1983 to April 1984. Both Dr. Schmidt and I spent several hours sitting around a table going over all the replies. The replies were categorized as follows with the percentages rounded to the second decimal place:

Only 5.52% of the replies were considered by the author *and* the Editor to be worthy of consideration. I was hoping to get five; we got seven.

21.26% of the total replies did not follow the simple and carefully stated rules. Therefore, they were rejected. When you play a game, you play by the stated rules or you don't play at all.

6.31% said, in effect, "I don't like your rules, so I'm making up my own rules which I think are much better." These were also immediately rejected. Either play by the stated rules or don't play at all. Most of all, don't argue with the gamemaster, contest director, umpire, or other game official.

17.30% of the replies came from a single high school class studying the future. It was a class assignment. It was a laudable effort. Most of the students tried hard. However, their efforts were gravely hampered because, in common with the majority of replies, they were

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working with incorrect, incomplete, or outmoded data.

49.61% of the replies (66.91% of the overall input, if the high school futures class is included) discussed problems that were either (a) not technological ones, but social and political instead; (b) already solved or well along the road to solution; (c) trivial and parochial in their scope; (d) based on incorrect, incomplete, or outmoded data; and/or (e) the result of someone else's telling the respondent that the problem was a problem because the expert said so, whereupon the respondent stated it on faith without checking.

Before proceeding, it is necessary to justify why most of the replies were considered in this last category.

Listed as technological problems were (1) control of nuclear weapons, (2) the "population explosion," (3) the "energy shortage," (4) the "raw materials shortage," and (5) "pollution" in various and sundry forms.

Control of nuclear weapons, once considered to be a political and diplomatic problem because there was no technological solution, is indeed now being solved by technology (although it is still an emotional problem). This discussion is worth more than just another 1500-word column. In fact, several books (including some of mine) have discussed various aspects of it. The only way a technology can be controlled in this world is to redirect it. Herman Kahn believed that the control of nuclear weapons was perhaps the most important overall problem in the world today, but he was also realistic enough to observe that "the only way to get rid of most of the nuclear weapons in the world is to have a general thermonuclear war." And, even when it's over, nobody is really sure whether or not all the weapons have been used. The big thermonuclear terror is the pre-emptive ballistic missile strike under the MAD doctrine. The solution to this is now a technological one; it can be done and it will be done because ballistic missile defense has been a policy of the United States since March 23, 1983.

The "population explosion": Data from many sources now clearly indicate that, although the world population is still increasing, the *rate* of increase has decreased. In other words, the explosion isn't exploding so vigorously any longer. The S-shaped Gompertz curve has inflected and will level out within the next fifty years.

The "energy shortage": The only reason we had an "energy shortage" was to provide an excuse for some politicians and bureaucrats to gain control of natural resources and thereby gain control over people. It was based on the fallacious conclusions of the "limits to growth" hypothesis which, in turn, was generated by an incomplete computer model fed either with incomplete or biased data.

The "raw materials shortage" was used by me as a rationale for driving the Third Industrial Revolution in 1972–1975. As part of a consulting team working for NASA on a study of space industrialization in 1977–1978, I blew away my own rationale when we discovered that there was no raw materials shortage.

"Pollution" is a semantically-loaded term, as I've pointed out in many of these columns in the past. For further

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details and data, see Chapter Three of my 1983 Macmillan book, *The Hopeful Future*. Pollution in any of its many forms may be a localized problem in some areas, but it is not a worldwide problem.

Unfortunately, this pessimistic "humanist" outlook on the future is the one most commonly taught in the schools today. Please see *Why are They Lying to Our Children*, by Dr. Herbert I. London (Stein & Day, 1984). I intend to devote an upcoming column to a new future studies program, "Visions of the Future," being jointly conducted in a growing number of school systems under the auspices of the Hudson Institute and Arizona State University. VOF doesn't try to sell a pollyanna optimistic future, but shows students how to evaluate forecasts to create a *realistic* picture of the future.

Some of the 5.25% of the valid replies were indeed innovative and showed considerable thought and reflection on the question.

Gary Knight of Baton Rouge, LA suggested that the big problem is maintenance. He's quite correct in stating that unless human beings continually repair and adjust equipment, even the most rudimentary of our technological services quit working. The high-tech world can be stopped dead in its tracks by a power blackout, a failure of the telephone system, or a minor breakdown in the transportation system. Developing nations can endure such maintenance breakdowns and continue to function in their old ways. Gary wants technologists to concentrate on the technical problem of making products maintenance free—i.e., designed for a 100-year life with a 0.0001 probability of maintenance. The achievement of this goal would have enormous economic and social impacts, of course, but that was not part of the game.

Along these same lines, Steven C. Thornton of Omaha, NB suggests that control of the weather is the most important problem. Although this isn't new, the way he presented it was novel and showed considerable systems insight. Being from the American midwest, he's naturally aware of the manifold impacts that weather has on the most basic of all our industries: agriculture. Since he wrote before the Ethiopian situation hit the headlines, he pointed out that weather was causing the African drought and was the primary cause behind the current starvation there. The complications include the fact that the local inhabitants haven't changed their ancient, inefficient, and destructive agricultural techniques that merely accelerate the situation under marginal conditions.

The macroenvironment problem was also addressed by Gwo-Jye Jang of Sunnyvale, CA who suggested that the most important technological problem was the construction and maintenance of closed ecological systems. Right now, this is the *only* technological problem that prevents us from establishing a permanent self-sufficient lunar settlement or making a manned expedition to Mars. By constructing and operating such closed eco-systems in space, Jang maintains, we will begin to learn far more about them because we can conduct experiments there; we can't on Earth because, if the experiment doesn't work, this is the only eco-system we've got

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and we don't dare screw it up. In the process of making ecology into a technology, the letter goes on, we can have far fewer misgivings about genetic engineering and artificial life because we'll know what such things can do to a large eco-system by trying them out first in space. Once we learn something about large eco-systems, we can feel far safer about trying to terraform Earth itself so that it's more to our liking.

I stated in the original column that I believed education to be the most critical problem. John S. Davis of Lambertville NJ added an interesting fillip to this. Education depends upon communication. John points out that communication involves moving information from place to place—in education, from the textbook and the teacher's mind to the mind of the student—which really isn't much of a problem, but that *managing* the information is. It's possible to download lots of information into a student's mind. But if the student doesn't know how to determine what information is meaningful and relevant at a particular time with respect to a particular problem, everything stored in the student's memory is useless. He reminds us of Sturgeon's Rule: "Ninety percent of everything is crap." He admits that this is primarily a social and political problem but suggests that it needs to be addressed technically first so that the new techniques can themselves be effectively managed! He's right because it doesn't really matter *what* you know as long as you know *how* to find what you need to know when you need to know it.

Walt Michael of Las Vegas, NV adds to this that the most important technical problem is the development of the direct link between the human mind and the computer to produce a true intelligence amplifier. This would have an enormous impact upon the educational system which he believes, along with me, is the most important factor in all futures considerations. H.G. Wells was right: "History is a race between education and catastrophe." The neat thing here is the fact that technical investigation into various phases of this have been going on for many years. It will certainly be possible to achieve a non-intrusive direct link between the human nervous system and the computer within a surprisingly short number of years. See my 1984 Dell book, *The Silicon Gods* for details.

Although neither Dr. Schmidt nor I agreed with all the suggested problems and reasons, we resisted the natural urge to toss them out because we didn't believe in them or because we felt we could pick holes in their rationales. This is because the suggestions were indeed innovative.

For example, Mike Speer of Milwaukee, OR suggested that the most important technological problem was the construction by machines of very small machines. He pointed out that true submicroscopic systems can and will operate in totally new and different ways than the current macroscopic systems. All of our technology, he observes, involves making devices *do things*, and it's been limited to a single range of sizes: things that we can see, even with a microscope. While he doesn't specify precisely what technological problems can be solved by developing sub-microscopic technology, it's pretty obvious

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that right now we cannot build a robot the size of a honeybee that will do all the things a honeybee does.

Finally, Del Cain of Augusta, ME presented a technological problem that is as much philosophical as technological, but dependent upon a technological solution. He wants technologists to develop structures and artifacts that tend to support healthy behavior in human beings—i.e., to help people live and rear children so they can develop to their full potential without trauma but not without struggle, difficulty, or drama. To do this, he believes that we should solve the technological problem of determining what are the optimum sizes and structures of healthy communities. In short, he feels that the big problem is developing technology with a life-affirming philosophy behind it.

Well, that's what technology is supposed to be all about in the first place, isn't it?

There you have it. Even though some of you didn't play by the rules or wanted to play by your own rules or offered problems based on obsolete data or shibboleths, I enjoyed reading every letter. I learned a thing or two. In the process of writing, I hope that you did, too. Basically, this was a dastardly plot to get you to think. All 127 of you are to be congratulated because, of the more than 100,000 highly intelligent readers of this magazine, you are among the fraction of one percent who stirred your neurons and responded to a game challenge. You tried. You were concerned enough about the future to give it a shot. Thank you. ■

● . . . Enlightened selfishness cannot be enough because enlightened selfishness cannot possibly be extended to include remote posterity. It may include the children, perhaps, and grandchildren, possibly, but it cannot be extended much beyond that because the very idea of "self" cannot be stretched much further. Some purely ethical considerations must operate, if anything does. Yet even that is not all. The wisest, the most enlightened, the most remotely long-seeing exploitation of resources is not enough, for the simple reason that the whole concept of exploitation is so false and limited that in the end it will defeat itself and the earth will have been plundered no matter how scientifically and farseeingly the plundering has been done.

Joseph Wood Krutch

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John Jinks

Tom Purdom

Some fictional clichés eventually achieve a sort of reality—but seldom exactly as their creators imagined.

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He stopped pushing buttons when he saw the woman making karate moves. It was the contrast between her clothes and the way she moved that made him stop and watch. She was stomping and punching with real energy and yet she was wearing a stocking cap and an overcoat that looked like it had been made for someone who was twice as big—the same kind of clothes you saw on the old women who pushed carts full of bags along some of the streets in the center of the city.

He was looking down on her from a height and the camera seemed to be pointing into a bare, dark little alley. Was this what women like that did when it got late and they didn't think anyone was looking into the alleys? Was all the shuffling and whining they usually did just some kind of act?

Her coat slid down her back as she made a sudden whirling turn, kicking one way and blocking another—just like you saw on TV—and he realized she had been wearing it slung over her shoulders. She bent over to pick it up and he swallowed. Underneath her coat she was wearing a sweater and a pair of low slung jeans that tightened around her thighs and buttocks and gave him that funny tingling sensation. A number on the lower right hand corner of the screen told him he was looking at camera 81295.

His hands moved across the keyboard. A shadowy gravel walk appeared on the screen. He was looking straight down the walk, at a pair of men who were standing under a tree talking. In the background he could just make out the water from a fountain splashing on a statue. *Camera Three,* the caption under the picture said. *Hamilton Square.*

It was a scene he knew well. He could see part of the square from the window of his apartment. In the daytime, of course, the gravel walks would be almost as busy as the streets around City Hall. There were usually children playing in the fountain, too.

He pressed the buttons again, hitting a number at random, and found himself looking down a tree-lined street from a viewpoint a little above adult head level. The dark sections under the trees made him think of the way things had looked the time he had put on a pair of sunglasses inside a dim little restaurant, but he could still see everything that happened on the block. He could even make out a cat trotting under a big tree halfway down the sidewalk.

Spruce Avenue, the caption said. *4600 block.* There was a woman in the middle of the block holding a child by the hand. Two men moved to the inside of the walk to let her by and then continued toward the camera.

His right index finger pecked out 81295. The woman in the alley had put her coat over her shoulders again. She was staring toward the front of the alley with her shoulders hunched over and both her hands pressed against her mouth. A shadow flickered across her coat and she hunched over further.

She was standing on the edge of an area that looked like it was receiving the light from a street light. Another shadow glided across her and he realized there must be people walking past the alley.

She shuffled into the light without straightening up. She edged toward the wall on the right side of the screen and

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he watched her slide down it and curl up on her side, with her knees drawn up. The alley had brick walls on both sides, like the alleys in the narrow little streets around the outdoor market, but those alleys usually had neat rows of trash cans in them. The camera could have been hidden in one of the sections of center city that had a lot of brick buildings, it could have been hidden in one of the alleys near his Aunt Vinnie's apartment, it could be peering into an alley in some neighborhood he had never seen . . .

He gave the computer another number and a broad, empty sidewalk appeared on the screen. In the middle of the block, a long hundred feet from the camera, a shadowy figure was standing inside a covered bus stop.

This was one of his favorite streets in the daytime. Over on the left, on the edge of the screen, there was a hobby store that had a window full of trains and spaceships. On the sidewalk just past the bus stop a man in a black suit juggled things and did magic tricks on days when the weather was good. Sometimes the street was so crowded with people he felt like he was trying to squeeze through a narrow aisle in a store.

The camera he was looking through was mounted in a big yellow cylinder a few steps from the corner. When you watched the street in the daytime, you were always seeing people holding up messages or just standing in front of the camera so somebody could see where they were. Now the whole block just looked cold and empty. The temperature that afternoon had been hot enough to make you sweat if you ran ten steps, but the street still made him feel like the man in the bus stop should be wearing a sweater.

81295.

Two more people had entered the alley. They both had their backs to the camera and they seemed to be standing over the alley woman. He could just make out the folds of her coat if he peered between them.

The woman jumped up. She threw off her coat with a flip of her shoulders and dropped into one of her karate poses. The other two people stepped back and the three of them stared at each other.

The two intruders had turned so he could see part of their faces. The smaller one, who was closer to the camera, had a beard that covered most of his face. The taller one had a thin, smooth face and he could make out a big rouge spot high on her left cheekbone.

The man edged toward the alley woman and the alley woman stepped back. He moved forward again and the alley woman retreated another step.

The tall woman had moved to where she was a little behind the alley woman and off to one side. She kicked the alley woman in the leg, up high, and the alley woman turned around. Two straight punches landed on the tall woman's chest but neither of them looked like the kind of blows karate masters dished out during the things the TV stations put on his screen.

The man grabbed the alley woman from behind. The other woman closed in with her fist raised above her head and brought it down on the alley woman's face. She struck twice more, with shorter, choppier versions of the same blow, and the man swung the alley woman around

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and took two of his partner's blows on his own back. He let the alley woman go and she stumbled away from him, her hands clutching her face, and slid down the right wall.

The other woman stared at the man. She bent forward and clawed at the air in front of her as she talked to him. Behind them, on the very edge of the field, the alley woman was holding her face and wiggling as if she were trying to push herself up the wall.

The other woman stepped forward and the man with the beard backed out of her way. She stood over the alley woman for a moment. The man's hands moved as he talked. The alley woman raised her head without taking her hands off her face.

The other woman pulled back her foot, very deliberately, and kicked the alley woman in the side. The man edged forward with his hands gesturing. The woman kicked twice more, once in the legs and once on the shoulder, coming down with a stomping motion, and the man scurried toward her and tried to grab her shoulders.

The woman hopped back. Her hands slipped into the pockets on each side of her jacket. The man raised his hands in front of his shoulders, palms outward, and there was another pause.

The alley woman pushed herself up the right wall. The other woman twisted past the man and her arm flashed out. The alley woman's hands flew off her face. She grabbed her right wrist with her left hand and held it against her shoulder. She looked at the other woman with her mouth hanging open.

The man gestured at the other woman. She jabbed at him with her knife and he stepped back.

She stepped between the man and the alley woman. She grabbed the alley woman's sweater and gestured with the knife again.

There was another pause that seemed to last half the night. The alley woman raised her hands in front of her face. The other woman plunged the knife into her shoulder and her head snapped back.

"DAVEY!"

He jerked around. His mother was standing in the doorway, staring at the screen. Her mouth was forming the same kind of circle that had opened in the alley woman's face.

"Oh my God."

His mother ran across the room. Her fingers dug into his shoulder. Her other hand tapped out a nine, two one's, and a CW. She held down a one with her forefinger while she pressed the C and the W with her thumb.

"Why didn't you call me? For God's sake. Look at her . . . look at her."

The woman with the knife was stabbing again. The man had disappeared while Davey had been watching his mother. The alley woman was trying to block the knife with her arms—she wasn't doing any of the things karate people did on TV—and the tall woman was slashing at her hands as if she was trying to hack them off.

His mother was leaning over the terminal as if she wanted to crawl inside. He had to drop to his knees to see the screen between her arms.

"C'mon. *C'mon*. Where are you? Where in the hell are you?"

A white fog filled the screen. A big light erased all the shadows. The woman

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with the knife looked up. A thick plume of fog erupted beside her. She turned away from the alley woman and lurched toward the middle of the alley. She doubled over, her free hand clutching at the air, and sprawled across the ground.

The alley woman had already slid down the wall again. Two police officers in short sleeve summer uniforms ran into the camera field. One of them bent over the alley woman and the other one joined him as soon as he had checked out the other woman.

One of the officers jumped up and started talking into his radio as he looked up at the camera. The other officer was opening the alley woman's coat and examining her wounds.

"I couldn't sleep," Davey said. "I got up because I couldn't sleep and I thought I'd see what the city looked like at night."

"Why didn't you call me when you saw that? How long has it been going on?"

"I thought she knew karate. She was practicing karate in the alley. I saw her."

The screen split without warning. A police officer with white hair and a mustache looked out at them. A subtitle identified him as Sergeant Allen Juarez.

"Mrs. Franks?"

His mother had automatically positioned herself in front of their own camera as soon as the officer had appeared. "I'm afraid you're going to have to interrogate my son, officer. He was the one who saw the whole thing. I just came in the door and saw him watching it."

The officer frowned.

"He's five," Davey's mother said. "He'll be six in October."

Sergeant Juarez relaxed. On the other part of the screen an emergency crew was maneuvering the alley woman onto a stretcher. The two police officers were standing over the woman who had attacked her.

His mother turned the camera mount toward his side of the console. "Sergeant Juarez wants to ask you some questions, Davey. Try to answer them as well as you can."

"I was just watching," Davey said. "I wanted to see how things looked at night."

"And what was happening when you first picked up this camera, Davey? Was this woman already being attacked?"

A light blinked on the terminal when he was halfway through the story. His mother pressed some buttons and cut in when she read the words that replaced the scene in the alley on the left half of the screen.

"Excuse me, Sergeant Juarez. We seem to have a call from the mayor's office—from someone named Julia O'Kane. Can I put her on and tell her what you're doing?"

"Just a minute."

Sergeant Juarez turned away from the screen for a moment. He bent over as if he was dealing with an off-camera keyboard and came back to Davey. "She'll be listening in while I'm talking to Davey. Is that all right with you?"

His mother shrugged. The sergeant stared out of the screen without responding and she realized she was off-camera. "I guess so. Go ahead."

"They may want to use this for publicity purposes. You have the right to

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deny the use of this recording for any purpose but the investigation and prosecution of a crime related to the events under discussion."

"I understand, sergeant."

Nobody seemed to be angry at him. Sergeant Juarez kept reminding him he should punch 911 anytime he saw anyone hitting someone or using a knife or a gun, but most of the time he just asked questions. Nobody seemed to be upset because he had sneaked out of bed and used the cameras in the middle of the night.

"I wouldn't have to keep asking you all these questions if you'd hit 911," Sergeant Juarez said. "The system starts recording everything on your screen as soon as you call 911. Do you understand that, Davey?"

Davey nodded. The sergeant's face blurred. His mother put her hand on his shoulder again and he lifted his head off his chest and peered at the screen.

The sergeant smiled. "The statement you have just made has been recorded in duplicate," he said formally. "If you do not make any statement to the contrary, you are agreeing to the use of this recording in any legal proceedings that may be related to your statement. Do we have your permission to use the statement in that way?"

"Of course," Davey's mother said. "Certainly."

Two more people came on the screen as soon as the sergeant said thank you. The man on the left was a reporter and his mother said the woman on the right was someone from the government. They were both asking questions, but now they seemed more interested in the reason why he had watched the woman.

He was fighting to stay awake but he didn't want to miss anything. He had always known all kinds of things happened after his mother put him to bed. She kept telling him he wasn't missing anything, but now look at him. A reporter was asking him questions. People kept telling him he had saved someone's life.

"I thought she knew karate," he said. "I didn't know people like that did karate."

"Didn't you know you should call 911 when you saw them fighting?"

He looked at his mother but she was just smiling at him. Everybody seemed to be smiling at him, no matter what he said.

"I thought she knew karate. I thought she didn't need the police."

The government woman stopped smiling. She was still looking out of the screen at them but her face had gotten very serious and her eyes looked like they were staring at something else. "This is a perfect example of the value of the volunteer citizen surveillance system. No city in the world could hire enough people to watch all the cameras we now have in place, twenty-four hours a day. At any hour of the day and night, even in back alleys, every criminal in the city has to be afraid someone like Davey Franks may be keeping watch. Davey, when you grow up, I hope you'll always remember what you did tonight and . . . "

There was a long tunnel between him and the government woman. Her voice was echoing and re-echoing. The reporter and his mother were both smiling again . . .

* * *

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His mother went to the terminal as soon as they got home the next afternoon. She flipped through the index screens for a minute and then the alley woman and the woman with the knife appeared on the screen. His own face hopped onto a circle in the upper right corner and his mother turned toward him and beamed. She had told him he should stay in bed and get his sleep, but she still hadn't said anything angry. She had even been smiling when she had told him that. And now she was smiling and saying things about how his hair looked on the screen and the way he kept blinking and trying to stay awake.

The alley woman's face has an X over it. The woman from the government popped onto the screen and said the exact same thing she had said last night. She even had the same serious look on her face. "The hidden camera section has received more criticism than any other aspect of the volunteer citizen surveillance system," the government woman said, "but this is just the type of incident the administration had in mind when it put the hidden camera section into effect. The city government can't put a camera in every alley in the city, but if criminals know *some* of the obscure, less frequented sites have cameras . . . "

A man took her place and started talking about the alley woman. She wasn't a real alley woman, the man said, but someone who lived a few blocks from the alley. There was something about "unconscious suicidal tendencies masquerading as vigilanteism" and Davey started to ask his mother what that was. He wanted to know what "deterrent" meant, too.

He stopped when he saw himself in the circle on the screen again. The scene in the alley had been running all the time the other people had been jumping in and out of the corner. Now the emergency people were strapping the fake alley woman onto their stretcher. "I thought she knew karate," he was saying on the screen again. "I didn't know people like that knew karate."

The white coated figures lifting the stretcher grew fuzzy. The circle expanded until it filled the screen. Words appeared under his face—LITTLE BROTHER IS WATCHING YOU.

His mother looked back at him and smiled.

"What does that mean?" Davey said. ■

● In a world short of raw materials, it is not hard to predict that by the turn of the century employment will be 80 to 85% in the service trades. The economy will grow, and will be stimulated to grow, *not* by expanding our physical production but by expanding our service economy.

Louis Harris
Carl Sagan

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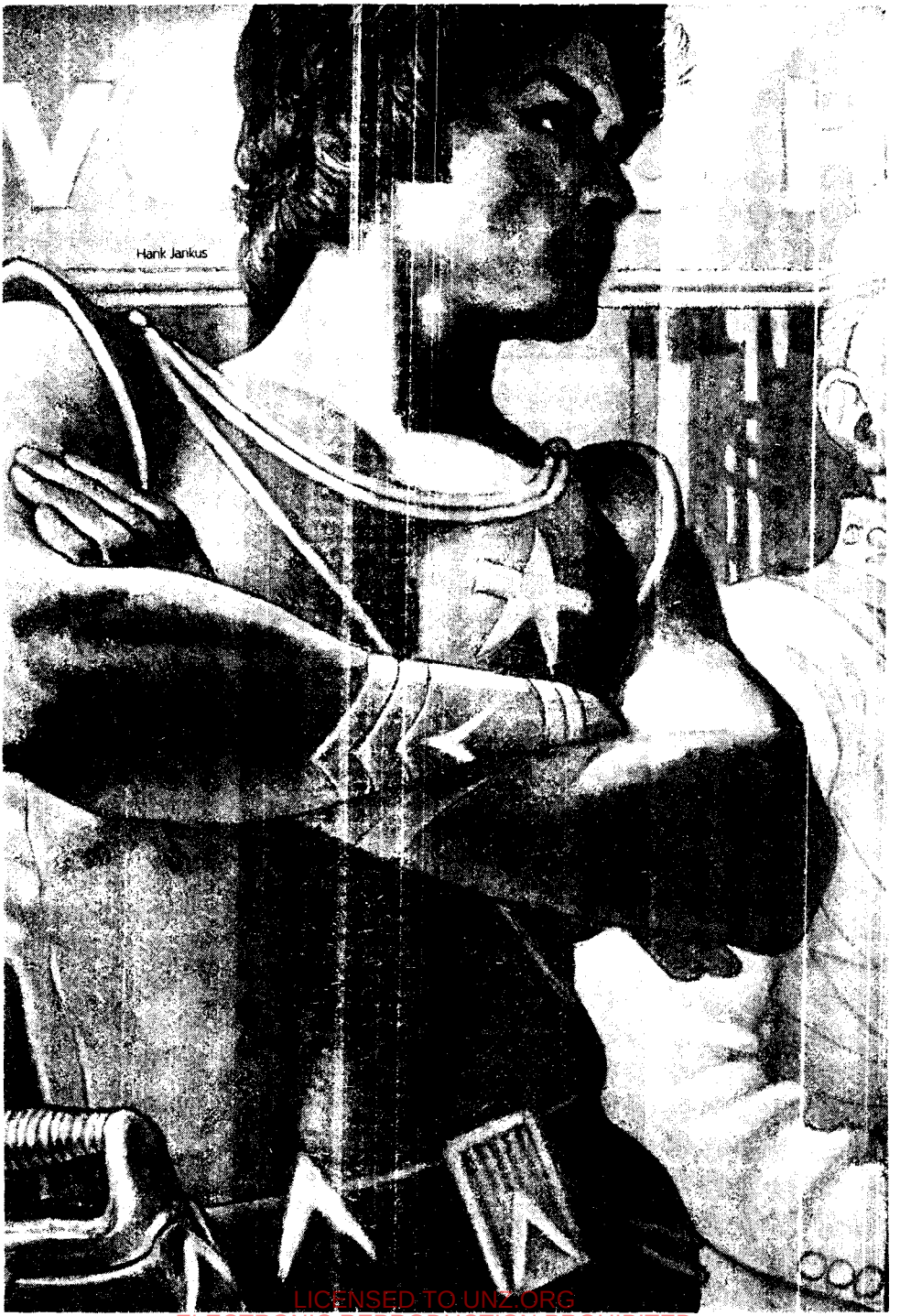

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Sam Nicholson

WHAT WAS THE NAME AGAIN?

Can a good thing be carried too far?

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"You're cutting it close, fellah," Wheel Security Constable Harry Laird told himself. He quickened his pace along the main corridor of the Administration Wheel, his blue-and-silver Duty Uniform gleaming smartly at his broad shoulders and slim hips.

The corridor time slots were blinking 0755 GST. Already the wheel's entrance airlocks were reporting a vehicle tailback. The mooring robots were double-parking the skimmers on the mooring racks. Today's general election would draw voters from the six wheels that comprised the Orbit Ten Complex.

Everyone would rather have voted at his home wheel, Harry reflected, but home-voting had not worked fairly. Too many deceased citizens had returned from the Beyond to cast their ballots. There had been too many "oops, sorry" computer glitches. Only a strictly neutral central administration could guarantee an unbiased election.

Especially, thought Harry, when a demagogue candidate like T.T. Carroway was stirring up every far-out nut in the complex. "C'mon, folks, demand your rights, the more the merrier," said the back-slapping T.T., encouraging every snowball to become an avalanche. Wheel dwellers had forgotten what an avalanche could do. Under the presidency of the sensible Arthur Monroe, the wheels were prosperous and contented. Dull, maybe. But in space, thought Constable Harry, domestic tranquility was a pretty good thing.

Farther along the curving corridor he could see a crowd milling outside the glass-walled Voting Hall. He straightened his shoulders and drew his white electro-wand from its padded holster.

"Line up behind the ropes, please. No need to push," he said good-humoredly. "Have your identity cards ready for the clerks."

With his wand at minimum power he directed the swarm into a single file. When they were behind the traffic ropes, he keyed a wide glass panel open, stepped into the Voting Hall, and closed the panel.

In the foreground of the large hall was a low counter at which four attractive girls, election clerks for the day, sat behind four computer terminals. At the rear of the hall were the curtained voting machines. In a side wall was an automatic sliding door, through which the voters would leave after casting their ballots.

Harry had eyes only for the slender, green-smocked girl at the first terminal. She had curly brown hair and a sweet countenance that brightened as Harry entered.

"Oh, Harry, you're almost late," she chided softly.

"Good morning, Lissa," he smiled. "Unlock your console and run my ID through ballot control. I want to be first at your voting station."

She glanced demurely at the modest diamond on her finger. "You're always first in my heart," she murmured, and blushed. Then she said, "But the computers can't be unlocked until the Special Interest Monitor Persons are in their chairs. Haven't they come?"

"Not yet. There's a vehicle tailback at the entrance bays."

Her eyes went anxiously to the small time blip on the terminal. "Oh, it's after eight o'clock! Please, Harry, do take

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your watch post. We shouldn't be talking."

"Nervous?" he smiled.

"Of course I'm nervous! My first assignment to a voting checkpoint!" She brought a folded leaflet from her pocket. "I've studied the rules until they're worn out. Please, darling—"

He bent over the counter, gave her a quick kiss, and keyed himself out of the hall.

The line of voters was bunching impatiently. The nearest figures caught his attention. Wheel dress was varied, to be sure, as the citizens enlivened their leisure hours with every conceivable costume, but these people seemed to be overdoing it.

The manufacturing wheels, experimenting with new fabrics and alloys, had encouraged multicolored jumpsuits, gossamer saris, metallic jackets. So, thought Harry, there was nothing too unusual about the shock-haired fellow in the pink-and-yellow boiler suit, or his leather-jacketed friend with black-lacquered hair and a razor cut on his chin. The whole gang looked a bit wild-eyed perhaps—

His critical inspection was interrupted by an exec-coveralled, middle-aged man who stepped out of the line, came forward, and asked, "What's the hold-up, officer? If Administration thinks we've nothing better to do with our time—"

"Sorry, sir," Harry replied equably, "we're waiting for the Special Interest Monitor Persons."

"The damned SIMPs!" muttered the exec. "A Special Interest on every issue! Compulsory Health. Single Mothers. Single Fathers. Kids-Against-Mothers-And-Fathers."

Still muttering he tried to rejoin the queue, but the Fashion Freaks jostled him away. "End of the line!" they chorused.

Harry said, "Let the gentleman in." His wand hummed a path, and the exec resumed his place.

Now the SIMPs came in a rush. Harry stepped forward to stem the tide. He keyed the glass panel open and told them, "Take your designated chairs beyond the consoles. No accosting voters. Leave all brochures outside the hall, please."

The monitors glanced at his determined chin and broad shoulders and obeyed. When they were seated inside the hall, Harry stepped back from the open panel and announced to the waiting line, "The voting may now begin. Use the first available terminal. After voting, exit at the door with flashing symbols."

"Pig!" spat Shock-Hair.

"Despot!" sneered Leather-Jacket.

Constable Harry was having none of *that*. "Out!" he ordered. His wand *zimm*ed, cutting the two name-callers out of the line. Their group pressed around him.

"Let the voters into the hall," Harry said to them. "All right, folks—single line throughout." He again addressed the scoffers. "ID's, please."

"You've no right to delay us," Shock-Hair retorted.

"What's the hurry?" smiled Harry. "You're not voting twice."

"Oh, yes, we are!" piped a voice from the gang. "At least twice!"

Leather-Jacket glared at the speaker, who subsided.

"Your ID's," Harry repeated.

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Shock-Hair held out his identity card. Harry read, "Bruce Primus Biped." He commented, "Great Galaxy!" He took Leather-Jacket's card and read, "Secundus Infinitus."

"We've a legal human right to choose any names we want," growled Leather-Jacket.

"Sure, of course," said Harry, handing back the cards. "An election really brings you weirdos out from under the cosmic detritus, doesn't it?"

Other ID cards were being thrust at him defiantly. He waved them aside. He had seen Security Colonel MacKay sauntering along the corridor. He said to the group, "All right—alternate your places in the line."

They blended into the moving file. Harry stepped forward to meet the colonel. He deactivated the wand, thrust it into the holster, came to attention, and saluted.

Colonel MacKay returned the salute and smiled. "At ease, Constable." He paused, smoothed his graying mustache, lifted his eyebrows, and gestured to the enfiling group. "Trouble?"

"Just the usual, sir," Harry replied.

"Yes," the colonel sighed. "Can we re-elect Monroe?"

Harry opened his mouth, then reconsidered. "Sorry, sir," he said stiffly. "No political discussions within fifty meters of the Voting Hall."

The Colonel laughed. "Good lad," he approved. "Carry on." He sauntered away.

Harry took a deep breath. Now that the first rush was over—

But it was not over. As he surveyed the corridor he saw men carrying clipboards. They were swooping down upon the voters who, having completed their ballots, were emerging into the corridor from the anteroom. He strode to the pollsters and said,

"Exit polls only at the exit bays. Break it up. You can buzz your editors just as easily from the bays."

He shooed them off and returned to his post. His minicom bleeped. He unhooked it from his belt and answered, "Sir?"

"Riot at 5B Sector," came the colonel's voice. "Find a clerk for entrance control and report on the double."

Harry stepped into the Voting Hall and said urgently, "Lissa! Shut down your console and come here."

She paled at the gravity of his tone but calmly waved the line forward to the next terminal, locked her console, and hurried to the opened panel.

"An emergency at 5B Sector," said Harry. "You'll have to take entrance control. The line is moving well—but keep alert for Bruce Primus Biped and his Halloween gang. Did you notice them at all?"

"Oh, my, yes," she said quickly. "As they filed past my console, I thought they looked—well, abnormal. But surely they're on their way to the exit bays?"

"I hope so. But I didn't like a remark about voting twice," said Harry seriously. He handed her the minicom. "If the gang pops up on the horizon, press the emergency override button and say, 'Mayday, Voting Hall.' "

She nodded, and put the minicom in her pocket.

Harry ran across the corridor to the ladder that rose to the Security tube within a wheel spoke. His thumbprint

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opened the hatch, and he boosted himself "upward" by pushing against the handholds within the tube. He went faster as the gravity pull decreased toward the core. He propelled himself around the core access ring until he reached the nearest Security tube to 5B. He entered feet first and "fell" with increasing speed to the rim, braking himself on the holds. He landed beside the hatch, thumbed it open, and knelt to peer down at the corridor.

Pandemonium assaulted his ears. Angry shouts and the muffled thump of wheel boots echoed up to him. He saw that placards swung and clashed as opposing SI groups collided across a line of Security guards. Advocates of DEMAND TWENTY-HOUR WEEK—MORE JOBS FOR EARTHLINGS were battering the proponents of RETAIN FORTY-HOUR WEEK —STOP WHEEL IMMIGRATION—DON'T CROWD OUR SPACE.

As Harry eased onto the ladder, the TWENTY-HOUR WEEKlings yelled and rushed him. He paused, glanced up the hatch, called, "Make it fast, fellows!" drew his wand, and dropped into his attackers as if he had a squad following him.

The bluff, enforced by mighty swings of his wand on maximum power, broke the rush. Believing they would shortly be outnumbered, the rioters dispersed into halls and bays, leaving a residue of decked opponents, broken placards, and confused guards.

Harry staggered to lean against the corridor wall, dizzy from his energetic SI-bashing as well as from placard blows. He saw the colonel move briskly among the fallen, who had begun to come to life. None seemed dangerously stunned or clobbered.

The colonel drew his minicom from his belt and spoke into it—probably, thought Harry, summoning the Medical team. The minicom still in his hand, Colonel MacKay ambled to where Harry was leaning.

"Good work, Laird," he smiled. "The old tricks are the best, eh? Are you injured?"

"No sir. A bit woozy." He succeeded in staying upright without the wall's support.

At that moment the brief wail of an override came from the colonel's minicom. Lissa's voice, miniaturized and tense, spoke out, "Mayday, Voting Hall."

"Yes, proceed," snapped the colonel.

"The—the Halloween troublemakers have come back," Lissa reported. "They're parading round and round with strange placards, demanding to vote again. I've shut the Hall entrance." There was a gasp, a blur, and a fading, "How dare you! Keep back!"

Harry's eyes desperately sought the colonel's.

"Right. Go ahead," nodded Colonel MacKay. "We'll be there presently."

Harry sprang up the ladder and retraced his course through the Security tubes. He wrenched open the hatch above the Voting Hall corridor.

He peered down. The sight unsettled him, as if he were looking at a nightmare. He thought, "How strange! How weird!"

Chanting unintelligible words in unison, the Fashion Freaks were stamping

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and swaying in a circle, placards rising and falling with the chant.

EQUAL RIGHTS FOR SCHIZOS, said the placards. ONE PERSONALITY—ONE VOTE. DOUBLE IDENTITY—DOUBLE BALLOT. FREE MULTIPLE PERSONALITIES—GIVE ALL OF THEM THE VOTE.

Lissa, a slim sentinel before the closed glass panel, had been backed against the glass itself, but her chin was held high and her eyes flashed with haughty contempt. Looming in front of her were—or were they?—Bruce Primus Biped and Secundus Infinitus.

Harry, descending the ladder, stopped to stare uncertainly. Biped's shock-hair was now slicked down like a thatched roof. His pal Infinitus had replaced his leather jacket with a black academic gown and mortarboard. So different did Infinitus seem that Harry searched for the raw shaving nick on his chin before deciding he was the same man.

He moved upon the circling chanters with his wand at maximum power and forced them against the corridor wall opposite to where the voting line had shrunk aside in apprehension.

The two ringleaders turned from Lissa and confronted him. He demanded, "What the devil are you loonies doing?"

At the word "loonies," the marchers surged from the wall, yelling, "Racist pig! Suppressor of alternate life styles!"

Harry plowed into them again, sweeping them into place. He waited for them to grumble into silence, then strode back to their spokesmen.

"You've voted once," he told Biped. "You can't vote twice."

"But that wasn't me," Biped protested. "That was Bruce, intruding again. I'm Dan. Here—"

He gave Harry another ID card. Amazed, Harry read the name, "Dan Fishnet II."

Biped-Fishnet confided, "Bruce is very unsound. No judgment. Can you imagine? He voted for Monroe! The psychiatrists say he opposes his own interests just to spite me. Poor Bruce. But, of course, my Carroway vote will cancel his vote out."

"You can't vote twice," Harry insisted.

"Pardong, *m'sieu*," interrupted the erstwhile Secundus Infinitus from beneath his mortarboard. He handed Harry an ID card on which he was identified as Professor Jules Sorbonne. "It is perhaps to deplore, but the voting laws permit each individual identity to cast a ballot.

"We schizos, *m'sieu*," he continued, "carry psychiatrist-approved identity cards to assist each of our personalities. The individuals within us are real and independent. They must be permitted the vote."

"Wait a minute," said Harry. He turned to Lissa, who was observing wide-eyed, the minicom clasped tight to her breast. "Do you still have the voting leaflet?"

Lissa breathed like a statue coming to life. She gave the minicom to Harry and drew the leaflet from her pocket. He hooked the minicom to his belt and unfolded the regulations.

"You will see, *m'sieu*," Infinitus-Sorbonne told him, "that any person presenting a legitimate identity card—"

"Yeah," interrupted Bruce-Dan. "Our multiple identities are strictly

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legit. They exist. Therefore they have a right to vote."

Harry was scanning the rules. He said abruptly, "Aha! Here we have the answer. The law says, 'Anybody attempting to vote twice or otherwise contravene these regulations will be denied his ballot.' Any *body* attempting to vote twice. That's exactly what your bodies are trying to do. I can order your ballots to be thrown out."

Both spokesmen protested, "But anybody doesn't mean 'any *body*'!"

"Anybody means any *body*, just as anytime means any *time*, and anyplace means any *place*. And," Harry continued triumphantly, as he saw Colonel MacKay leading Security guards down the hatch ladder, "your *bodies* have tried to vote twice. You're disqualified."

"Whazzat?" roared Bruce-Dan suddenly in a deep voice. He swept his coarse thatch from his forehead and hunched toward Harry, fists raised menacingly. "No kid palooka is telling the Blitzer what to do. The World Champeen ain't taking orders from a lousy cop!"

He feinted with his right. Harry swung the wand. The Blitzer came up under it with a solid left to the jaw.

Harry went down for the count, and knew no more.

He drifted painfully into consciousness and realized he was in a Clinic bed. His head was a chamber of aches and throbs. Someone was holding his hand.

He unstuck an eyelid. His sight flimmered along the bedside. The hand holding his was soft, graceful, and bore a modest diamond on one finger.

He opened both eyes and whispered, "Lissa!"

"Hush! You've been out for hours, but you'll be all right," she soothed. "Your head had been hit too hard in the other riot to withstand the further blow from that horrid loony's fist."

"The Blitzer," Harry groaned. "How many multiple personalities did that guy have?"

"It doesn't matter. None of them can vote. The colonel was tremendously impressed by your interpretation of the rules," she went on. "He says it shows a fine aptitude for official double-talk. Oh, Harry, he may even promote you to sergeant!"

"Sergeant?" murmured Harry. "That would mean an extra residence section."

"I'm sure we'll be quite cosy in our single cubicle," she smiled. She blushed and changed the subject. "The courts will immediately clarify voting rules to make sure that a physical body votes only once. President Monroe was re-elected by a landslide."

"He was? And I didn't get to vote for him," Harry said ruefully.

"But you did!" Lissa contradicted. "You see, we clerks were instructed to scrub the schizos from the ballot count. But I cheated. I re-entered Bruce Primus Biped. After all, his body was entitled to one vote, and I heard his second self tell you he had voted for Monroe. I figured, since his third self had knocked you out, the least his body could do was to cast your vote for you."

"Darling," sighed Harry, "you're wonderful."

"You have no idea yet," said Lissa softly, "how wonderful I can be." ■

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GEORGE WASHINGTON SLEPT HERE

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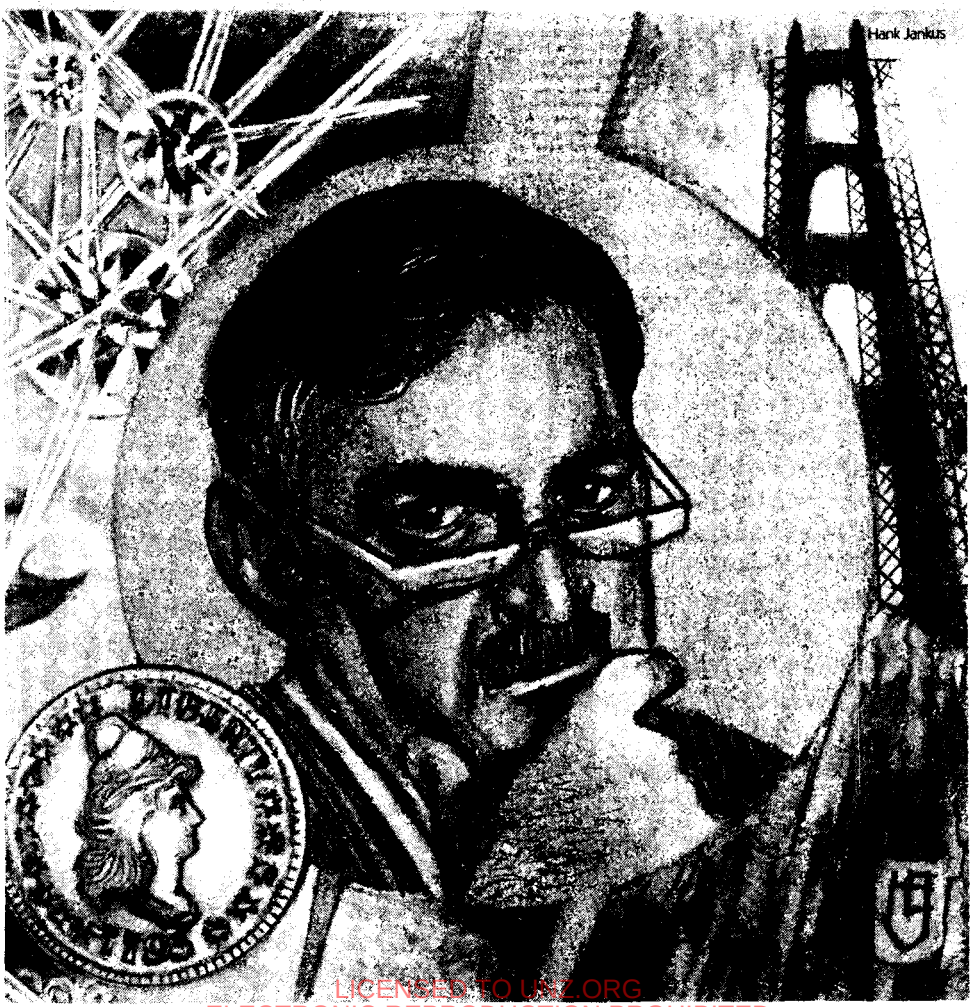
Charles L. Harness

Fair warning: the history you'll learn
in this tale may differ
slightly from
what you
learned in school. . . .



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1. Oliver Potts

Miss Catlin waited until her employer had laid his briefcase on the credenza and sat himself behind his desk. "Did you win your case, Mr. Potts?"

He beamed up at her. "Of course not, Miss Catlin. Any calls?"

"The local D.A.R. wants you to give a talk . . . preferably something early American. Refreshments."

"What was my last D.A.R. lecture?"

"Termite resistance of white oak log cabins, I believe."

"And that about exhausts my colonial expertise. On the other hand . . . refreshments, you said?"

"A colonial menu."

"Tell them I'll accept."

"They'll want to know the title of your talk."

"I'll think of something. And don't sound so cynical, Miss Catlin." He squinted at an engraved card on his desk. "What's this?"

His secretary sniffed. "Junk mail, Mr. Potts. I really shouldn't have brought it in. It just means somebody has accessed into the Bar Association roster."

"Gracious, Miss Catlin, it's an invitation. For membership in the Trust for Preservation of Mount Vernon."

"Translation: they want money."

"For a good cause, I'm sure. Wasn't there an enclosure?"

"Oh, Mr. Potts! You're so gullible." She handed him a folder.

"See, they're trying to duplicate some things that turned up missing when Washington died in 1795. Saddle bag, given to him by Congress in 1783. Long underwear, imported from London. A 1795 ten dollar gold piece. And so on. Where's your patriotism, Miss Catlin? They're trying to restore Mount Vernon the way it was when *he* died."

"Patriotism, Mr. Potts—and I remind you I got this from you—is the last refuge of a scoundrel."

"Send them one hundred."

"Mr. Potts. Your office needs painting. The reception room needs new furniture. That sofa is a disgrace. If you want to restore something, start here. Ten dollars. Not a penny more."

"Catlin—oh, the hell with it. Get the phone."

She picked it up. "Oliver Potts law office." After a moment she said to him, "It's Mr. York's secretary, calling from Sena City. She wants to talk to you."

"I'll take it here. Yes, Miss Joyner? Accident? What? *Dead?* Good God." (Potts *never* used profanity) Miss Catlin watched his face in growing alarm as he listened further to the stricken voice in his earpiece. "Due in court this afternoon? But surely . . . the local guys . . . Nobody will take it? The judge . . . Oh. Oh. What a . . ." He mumbled the word as he looked at his watch. "The commuter flights leave on the half hour. I can just make it." He bounded from his chair, grabbed his attaché case and dashed for the door. He called over his shoulder to Miss Catlin (who was standing there shaking her head): "Phone the printouts in to the plane . . . *Sena v. Bridge Authority* . . . Judge Roule . . . g'bye!"

Oliver Potts graduated tenth from the bottom in a law class of one hundred and forty-seven. He accepted his low estate philosophically. When he started his practice he assumed that rich clients

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with sure winners were not going to flock to his door. In this he was quite right. How then, he asked himself, shall I pay the rent, a secretary's salary, and sometimes eat? It was then that he made a remarkable discovery: for every winning litigant there is a loser. Fifty percent of all those anxious faces are losers. *They* are your clients! The field is white unto the harvest! Go get them, Oliver!

And so he did. Losers, sensing a kindred spirit, brought their cases to him in droves. Incredibly, some of them had money, and paid his fees. And so he acquired a certain reputation, absolutely unique in his county: during his entire professional career, spanning nearly two decades, he had never won a case.

Since he entered each individual contest expecting to lose, the foreseen result rarely surprised or disappointed him. But there was more to it. Opposition counsel dreaded taking the winning side versus Potts. Examples abounded. A prestigious law firm with a sure-win medical malpractice suit, after spending ninety thousand dollars in desk time, won a judgment of three dollars, of which they kept one-third. In another instance Potts lost a famous product liability case because of a local statute-of limitations, but the notoriety stimulated a dozen additional cases where the statute had not run out.

In a case of alleged failure to pay for a newspaper, he successfully counterclaimed for false arrest, libel, kidnaping, and assault. But his client was still required to pay five cents for the paper.

Perhaps the closest Potts ever came to not losing was his famous hound-dog case. His client, serving a ten-year sentence, had been put in charge of the bloodhound kennels at the prison farm. Soon thereafter he walked out. Since he took all the dogs with him, there was no easy way to track him. Ten years later he was recaptured. Potts, his court-appointed lawyer, argued that the warden was criminally negligent and guilty of entrapment for putting his client in charge of the dogs. Potts argued further that the ten-year sentence must now be considered served, in that his client had cared for the dogs for a full ten years and indeed had set up a nationally known breeding farm based on the original prison nucleus. The care and feeding came to twenty thousand dollars, plus interest. His client went free, the state paid a large sum in settlement; yet Potts felt that he had lost, since his client had to return an equivalent number of dogs to the prison kennels. The warden and D.A. both took early retirement. They went partners on a chicken farm in eastern Maryland and were never heard from again.

The current curse at bar smokers: "May you win against Oliver Potts."

Potts accepted their opprobrium with rancorless resignation.

An hour after Potts left his office he was looking down out of the plane window. Below him, meandering off to the right, was the big river. From up here, though, it didn't look too impressive. And there were the twin cantilever towers, one on each side of the river, nicknamed George and Martha by the irreverent. Toys at this height, but soon they'd hold a span between them, and the whole thing would be transformed into the great George Washington Bridge. Not intended to rival the famous George

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Washington suspension bridge in New York City, of course, but named rather in memory of Washington's early surveying trips into the wilderness. He had crossed the river on a raft when he was eighteen, and on the western side had carved his initials on Sena Rock: "G.W. 1750." The scratches were now covered by steel and concrete of the growing cantilever, but Potts had read that plaster casts of the legend had first been made, and that miniatures (made in Taiwan) could be bought at local souvenir stands.

That tower on the right—"George"—*that* was what all the fuss was about. He tried to remember some of the things he had read in the papers. His friend Fenleigh York had been insane to take the case. Or else the fee had been irresistible.

"Mr. Potts?" called the stewardess. "Mr. Oliver Potts?"

He held up his hand.

"You have a call."

"Thanks." Catlin had got the data already. Nice work. He walked back to the communicator cubicle, pulled the curtain behind him, and pushed the "Come In" button on the keyboard.

He watched intently as the screen came alive. First, the abstract.

Sena v. Bridge Authority

Plaintiff petitions order (a) restraining Defendant from taking a certain riverside parcel by eminent domain & (b) requiring Defendant to dismantle cantilever bridge tower from said parcel.

Good Lord! thought Potts. Fen took money for *this?* Well, let's go on. Now we get the people.

There's Judge Maximilian Roule, walking up the courthouse steps. (Nice holo definition.) Nervous springy man. Grim face. Combination of Louis the Fourteenth and Machiavelli. Maybe just the camera angle? Stiffest sentences in the state. Maximum Max. Lines of print now zipping in on the CRT. Net worth: indeterminate. Some sources say near bankruptcy. Others say he has recently recouped lost fortune. Hobby, bridges. Off you go, judge.

Next, Sena. Miss? Mrs.? York's client. And now mine. Is that her first or her last name? Named for Sena City? She's walking across a lawn. That's probably her house? Yes. The Bridge Authority let her move it away from the condemnation site. Fine figure. She turns, waves. Smiles. Beautiful face. Pale coppery complexion. Age, uncertain. Looks to be about twenty-five. Income, independent but modest.

And now, counsel for the opposition, Barton Badging. Bachelor. President County Bar Association. Presiding chairman local chapters FFV, SAR. President, Sena City Numismatic Association. Monographs: *Seventeenth Century Immigrants to Tidewater Virginia*; *George Washington's Personal Silver Converted to Dismes and Other Coins*. The holo showed Badging making a speech at a banquet table.

"Vocal," prodded Potts.

"Poor audio," apologized the cassette.

"Go ahead."

Scratchy words came from the little figure. "Fellow numismatists, twenty years ago I said to myself, there is a perfect 1795 gold eagle out there, waiting for me. Where? I don't know. All I know is, it's there. Do any of you know its whereabouts? If so, please tell me. Before I die, I want to see that

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beautiful coin, in proof condition. Not merely extremely fine. Not merely uncirculated. Not even MS—mint state. This coin at the end of the rainbow, this elusive piece of gold, will be in absolutely *proof* condition."

"And *you*," muttered Potts, "are an absolute crock." But then he stopped to think. "On the other hand, maybe this kind of thing is standard at Sena City. Watch out, Ollie."

Next, Marcus Reed, Bridge Authority Chairman. Coming out of the Sena Athletic Club. Looks both ways before he crosses the sidewalk to his limo. Entrepreneur. Politician. Billionaire. Reed is major stockholder in Reed Construction, Inc., building the Bridge.

Potts punched "hold." The little holo figure of Marcus Reed froze, glaring up at him as though affronted by the restraint.

Potts asked the computer, "Who are the other stockholders in Reed Construction?"

"Mrs. Reed . . . "

"And . . . ?"

"There's a twenty-five percent slice, owner unidentified."

"Find out."

"Data insufficient."

He punched "run." The rear door of Reed's car opened, and the great man got in.

Who opened the door for him? thought Potts. Of course, the chauffeur might have done it by remote.

He punched "reverse," then "run."

There. A hand; a blurred face. Potts zoomed in. Poor definition. Yet . . . Was it possible? His heart began to pound. Judge Roule. Maximum Max.

It doesn't necessarily mean a thing, he told himself. Maybe they're old buddies from college. Maybe they're working together on a local charity. And maybe I'm the queen mother.

His voice was a dry crackle. "Breakdown, Roule's assets."

"Unavailable."

"Does Roule have an equity position in Reed Construction?"

"Unavailable."

"Terminate Reed. Give me the police report on the death of Fenleigh York, last night."

He watched the lines scroll up.

"York car accompanied by truck crashed through cable railings on Palisade Drive. York vehicle found on its back at bottom of hill. Truck burned midway to river. Unidentified witness states truck forced the car off the cliff, but locked bumpers with it at the last moment and went over with it. Truck reported stolen Wednesday last."

Then the ambulance report. Hospital report. Both York and truck driver DOA.

"Any holos?" asked Potts.

"No."

"Where was he going?"

"Data insufficient."

"Does Palisade Drive lead to the airport?"

"Yes."

"Did Mr. York hold a reservation?"

"No."

That didn't mean much, one way or the other. On a commuter flight you didn't generally need a reservation.

"Did he make a phone call to Capital City yesterday?"

"Checking. Yes."

"To whom?"

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"It's listed simply as the Judicial Grievance Committee."

Oh God. Fenleigh was going to blow the whistle on something or somebody. The judge? Marcus Reed? But they had found out. And they took his whistle away. Permanently. His friend had been murdered.

And where, he mused, does that leave *me?*

"Fasten your seat belts," ordered the bland dead voice of the stewardess. "Extinguish all smoking materials. We are landing at Sena City Airport."

2. Sena

He parked his rental car in a nearby lot, dashed up the courthouse steps, and found the right courtroom by instinct. And so up the aisle and through the swinging gate at the bar.

They were all waiting for him.

The woman was a striking beauty. Light amber complexion, lustrous black hair and eyes. "Oliver Potts," he puffed. "Your new lawyer, if you want me."

She shrugged, as if to say, Do I have a choice? Then her mouth twisted into a half-smile. "Yes, Mr. Potts. Of course I want you."

He nodded, then walked up to the bench. "Oliver Potts, your honor, replacing Mr. York."

Judge Roule scowled. "All right. Tell the reporter, Mr. Potts."

On his way back to his seat he gave his card to the court reporter and stopped by to introduce himself to opposing counsel. He noted that Barton Badging was a prim-looking gentleman who wore gold-coin cufflinks, a tie pin fashioned from a coin, and had a gold-coin watch fob dangling from a heavy gold chain stretched across his vest. Opposing counsel stared up at him in grave distaste. "Barton Badging," he said. He made no effort to accept Potts's outstretched hand.

The judge hammered with the gavel. "If the social hour is over, we have a trial in progress." He glared suspiciously at the newcomer. "We know you by reputation, Mr. Potts. But let me tell you right now, I like things clear-cut in my court. A winner wins clean. A loser loses clean, and no funny business. That's it. Black and white. Do you understand, Mr. Potts?"

"I couldn't agree more, your honor."

"Good. So sit down, Mr. Potts."

Potts sat down beside his client.

"Motions?" asked Judge Roule.

Potts was immediately up again. His eyes locked with the judge's for one long moment. Patches of goosebumps raced up and down his cheeks, his arms, his back. His biceps contracted. His veins were awash in adrenalin.

It was happening to the judge, too. The lawyer read the body language clearly. The man behind the bench fidgeted; he wet his lips with a thick wet tongue. He fiddled with his gavel. He returned the lawyer's stare uneasily.

In these milliseconds (while no one else in the room noticed) they measured each other like skilled swordsmen. They circled like wolf and prey, like cobra and mongoose. Starfish and oyster. The question was, who was who? Who was hunter, who was hunted? No way yet to tell. But Potts believed he would know very soon.

He spoke, and as he spoke, he opened the lid of his attaché case in a careless absent motion and switched on the tekt-

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x cube. He said, "Your honor, as you may be aware, I am absolutely new to the case. So that I can familiarize myself with the issues, I request a continuance for one week."

Judge Roule stared down at the lawyer through wide-spaced eyes set deep under bushy brows. Slowly, his smooth cheek pads pulled back, lifting his mouth into a fanged grin. "No, Mr. Potts, no continuance."

So, thought Potts. Now we know. The roles are defined. You're the heavy. Just as I thought. Did you send out that truck that killed Fenleigh? Okay, Roule. I expect to lose, but in the process, you're going down. He said: "If I cannot have a week, your honor, could I have at least one hour with my client?"

"Oh come now, counselor! Don't you read the papers? Surely you know this is the famous George Washington Bridge case. It's been going on in this very courtroom for days. Look at the reporters behind you, there in the first row." The jurist frowned, then sighed, as though unable to cope with the incompetence of imported counsel. He leaned forward. "Listen carefully, Mr. Potts. You won't need a continuance or a long rambling futile discussion with your client, because I'm going to brief you myself. The Bridge Authority is building a bridge, known as the George Washington Bridge. As a preliminary necessary step, the state has taken by eminent domain certain access properties on both sides of the river. Did the state have the power to condemn and take? That's the main issue, Mr. Potts. Plaintiff claims the taking was improper, in that the parcel on one side of the river included the Sena Rock, given by the United States to a foreign power as site for an embassy or consulate or trading post, or something of the sort. Plaintiff also contends that the Sena Rock lacks the compressive strength to carry the weight of the structures that will eventually rest on it. She tells us that as soon as another five thousand pounds is added to the west cantilever tower—the so-called "George" tower —Sena Rock will collapse and the tower will drop into the river. To prevent this, she asks that I order construction be suspended, and that the bridge site be moved one quarter-mile upriver." He favored the woman sitting next to Potts with a mocking smile. "Have I stated the case, Madame Plaintiff?"

"Yes, your honor," she said quietly.

"Then," continued the judge, "believing that the interests of Plaintiff's alleged embassy and of the Bridge Authority will be adequately protected by prompt proceedings, and bearing in mind that this court serves the public interest in searching for an immediate resolution of all issues, I deny Plaintiff's request for a continuance. We will go forward. For your information, Mr. Potts, Plaintiff completed her main case yesterday. Today we hear from the Defendant, the Bridge Authority. Mr. Badging?"

As Potts sat down he flashed a reassuring smile at his client. She did not smile back.

At the other counsel table, Barton Badging got to his feet. "Your honor, we renew our motion for dismissal. Surely, this farce has gone far enough."

"I appreciate your viewpoint," said Roule. "On the other hand, this is a

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court of record. You must state your reasons.''

''Yes, your honor. First, the alleged treaty, Plaintiff's Exhibit One. Plaintiff concedes it is written in a foreign language, unreadable by anyone except herself. Indeed, she concedes that the granting party, an alleged tribe of alleged Indians, vanished from this area some three thousand years ago. This alleged treaty is sheer madness, your honor.'' He paused and turned to peer over half-moon spectacles at Oliver Potts. He smiled. ''But it doesn't stop there, your honor. No indeed. There's the matter of the identity of the foundation rock, the so-called Sena Rock, which Plaintiff urges is the site of her mysterious embassy. This rock, she would have us understand, is not part of the foundation bedrock of the area. It is not, she claims, native basalt, poured up from the bowels of our mother Earth two hundred million years ago, part of several thousand square miles of companion flow. Oh, no indeed. Nothing so geologically banal. *Her* rock is special. It was formed out of nothing; out of blank space, if you will, by esoteric processes known only to Plaintiff's countrymen. And why special? She does not say. She says only that it will not support the weight of the west tower.'' Mr. Badging chuckled mournfully. ''Really, your honor, if you will but look out the window''—he pointed, and they all looked—''you can see that the tower is substantially complete, and that the alien rock—if we may call it that—is holding up nicely.'' He took the lapels of his jacket in pink hands. ''If ever a case should never have come to court, it is this one.'' He bowed eloquently to the judge, perfunctorily to opposing counsel, and sat down.

Potts, who had been simultaneously reading, listening, and taking notes, now arose. ''We oppose the motion to dismiss. The Bridge Authority is attempting to moot this case by completing the west tower during this trial. I remind the Authority that if the treaty is finally upheld, the bridge would be subject to dismantling and removal. At Defendant's expense, I might add. But that problem is minor compared to the risk of life involved with continuing construction. The records show that there are never less than ten workmen on the tower, and that forty or more are not unusual, including riveters, welders, crane operators, painters, and others. If Sena Rock collapses, the cantilever tower comes down, and most of these men will be killed.'' He took his seat.

The judge seemed to study the oak surface of his bench. Then he looked up and searched out the face of the woman seated by Potts. He said carefully: ''The record is not sufficiently complete for me to rule just now on Defendant's renewed motion for dismissal. In any event, I have a couple of questions for Plaintiff. Madame . . . *Sena*, is it?''

She rose gracefully. ''Simply Sena, your honor. It is an abbreviation of Asenaapeeneneniwa, which in the tongue of the Algonquian Indians, means 'Spirit-of-the-Rock.' ''

''Hm. You are an Indian?''

''No.''

''Indeed? Of what race are you? Who are your ancestors?''

''I have no race and no ancestors.''

''No games, young woman. Remem-

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ber, I can hold you in contempt. Everyone has ancestors."

"Not I, your honor."

The judge's eyes flashed. "Not even a mother?"

"No."

"Then, how came you into existence?"

"I was made by . . . certain people."

"When?"

She hesitated. "I'm over twenty-one, your honor."

The judge sighed. "I see. Let's go on to the Rock. I gather that the people who ah, 'made' you, also 'made' the Rock."

"Yes."

"When did they make the Rock?"

She shrugged. "Before they made me."

Roule's face reddened. "You are being evasive, young lady. I can accept a certain amount of evasiveness when a lady's age is involved. But the age of Sena Rock is another matter entirely. If you know when your people made the Rock, I require that you say."

"The Rock is at least ten thousand years old; possibly twelve."

"But not more than twelve?"

"Not more than twelve."

The judge frowned. Then he glared at the tittering courtroom audience, then at Oliver Potts, then back at the woman. "You are aware of the state geologist's report, already stipulated in the pleadings?"

"Yes, sir."

"You know that report states that the bedrock in the abutment area is metamorphosed basalt, which is to say, tough, resistant greenstone, exposed locally some two hundred and thirty *million* years ago?"

"Yes."

"*Not* a mere ten or twelve thousand years ago?"

"True, your honor."

"How do you explain the inconsistency?" He leaned back in his plush highback chair, safe in the certainty there could be no rational explanation.

"It's simple, your honor. The geologist took rock samples at one-mile intervals. He missed the embassy site altogether."

"The embassy site, which is to say, Sena Rock, is not greenstone?"

"It is not. It just looks like greenstone."

Roule was thoughtful. "Let us back up a bit. Into this 'non-greenstone' the builders have cut great gaping holes. They have sunk giant rebars, they have poured vast volumes of corrosion-resistant concrete. On this basement rock abutment they have built a cantilever, with arms reaching backward from the shore and forward over the river. Sena Rock *looks* like bedrock. It is *acting* like bedrock. The cantilever tower is anchored to it firmly. It is supporting the tower nicely, just as greenstone is supposed to. But you say it isn't greenstone."

"It isn't."

"What is it, then?"

"Synthetic matter, your honor."

"Synthetic? You mean like synthetic fabric? Plastics? Something like that?"

"Not at all. The matter was synthesized from nothing . . . from space —using an energy catalyst. The atomic spacings . . . silicon, oxygen, the alkali metals, are quite satisfactory for

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imitation rock, but they're all wrong for true greenstone."

During this interplay Potts had been dividing his attention between his client, the judge, opposing counsel, and the tekt-x cube in his attaché case. This device was actually a remote laser-reading polygraph. It cast out a 360-degree laser net and brought back modified pulses in the reflected beams that showed the standard vitals in selected nearby personnel: pulse beat, blood pressure, respiration, galvanic skin response, and voice stress. In sum, the reader was a lie detector that operated without attachment to the subject. In prior litigation Potts had used it successfully to conduct simultaneous and continuing screens of the witness in the box, the judge, opposing counsel, and his own client. He had never served in an ongoing trial where everyone told the truth all the time. The fact no longer amazed him. Indeed, he accepted it (with morose reluctance) as a statement about the human condition, probably including himself.

He watched the recessed code lights on the tiny reader panel. He was getting some interesting readings from Barton Badging. His opponent was hiding something. I fear you have not led a lily-white professional life, Mr. Badging. But you're a featherweight compared to what we're getting from Maximum Max. The man was totally corrupt. Have to get back to him. But the judge wasn't the immediate problem. He could cope with corruption. The real trouble was with his client.

Sena wasn't registering at all.

It wasn't a question of under- or over-reacting. It was much worse. The tekt-x simply wasn't picking up any readings from her body. Nothing whatsoever. A marble statue would show more activity.

Perhaps the laser net was defective in her direction? He gave the box a quarter turn. Still nothing. He rotated the instrument back. As he did this, he saw she was watching him from the corner of her eye.

Ah, he thought. She's taking it all in. She knows what the tekt-x does. She knows she doesn't register. Now what?

"Sorry," she whispered. "I'll turn on."

The little lights assigned to her suddenly lit up. The base lines for all her vitals showed absolutely normal: pulse, 70; b.p., 125 over 65; respiration, 16; perspiration normal; no voice stress. As if to compensate for her zero emotional level, his own light panel began to flash. *His* pulse, blood pressure, and galvanic skin index readings were jumping off the register. He had stopped breathing, but now his chest was beginning to work again.

"Could I give you a tranquilizer?" she whispered.

"I'm . . . okay."

No. He wouldn't believe it. Somehow, the little machine had malfunctioned. They do that. These modern electronic marvels . . . when they work, they work beautifully. But when they don't, everything comes apart. Maybe a short somewhere. Have the technicians check it out. Seems to be working fine now. I overreacted. What's the matter with me? This woman is insane. How did I get roped into this? Fen was never stupid. Why did *he* take it? Money, probably. And now I've got it,

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and I've got some kind of duty to this madwoman. The county asylum is supposed to be around here somewhere. Maybe we'll all be in it before this is over.

For the next hour he listened to the drone of the enemy expert, as prodded and led by Badging.

"Now, Dr. Davis, you have heard Plaintiff's testimony that pressure alters the morphology of rocks and minerals?" said Badging.

"Yes, sir."

"Is that a danger here?"

"Not at all."

"Why not?"

"It is only *extreme* pressures that alter the characteristics of materials. At ten thousand atmospheres mercury solidifies at room temperature. At slightly greater pressures, boiling water solidifies, and graphite changes to diamond. At one hundred thousand atmospheres iron becomes non-magnetic. At slightly under one million atmospheres spinel is squeezed into perovskite. All these transformations are readily achieved in a diamond anvil pressure cell, and they all involve reductions in volume. However, such transformations cannot possibly take place under the pressures resulting from the west cantilever, the so-called 'George' tower."

"What *is* the average pressure on the George tower area?" asked Badging.

"Less than sixty pounds per square inch—about four atmospheres."

Sena bent over to Potts. "It's not the average pressure that's critical—it's the total *weight*. And they will indeed exceed *that*."

"Noted," whispered her lawyer. "We'll put you back on for that point during rebuttal." (If we get that far, he said to himself.)

"Your witness," said Badging.

Potts faced the expert. "Just now, Dr. Davis, you have offered considerable engineering data as to the effect of pressure on minerals."

"Yes, sir."

"You did the experiments yourself?"

"Experiments? I don't understand."

"Well, for example, did you go into the laboratory, take a piece of coal, and apply pressure to it, say in a diamond anvil, whereby you noted that at a certain pressure the coal changed to graphite? Is that the kind of thing you did?"

"Oh, no. I just copied some data out of an engineering handbook."

Potts addressed the judge. "All of Dr. Davis's testimony is obviously hearsay, your honor. I move it be stricken."

Roule pointed to the computer screen on the corner of his bench. "You see the green light, Mr. Potts. Motion denied."

Potts showed amazement. "But your honor, there's a long line of cases—"

"The computer has spoken, Mr. Potts. In this court admissibility is determined by computer. Our computer accesses *all* relevant cases, and it is infallible. Error is inconceivable; hence no appeal lies to the state supreme court. And certainly in this case it is in the public interest that our decision be final as well as prompt. Do you understand, Mr. Potts?"

"Yes, your honor."

"Any further cross?"

"I'd like to pose a hypothetical to Dr. Davis."

"Involving what?"

"Plate tectonics."

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Badging cried out, "Objection! Irrelevant."

Roule hesitated. He said, "Let's hear it, then I'll decide."

"Doctor," said Potts, "isn't it true that the Atlantic plate is subject to internal strains?"

"That's the current theory," admitted Dr. Davis.

"Such intra-plate strains, in fact, caused the great Charleston earthquake of 1886?"

"Yes, we think so."

"Now, if 'George' falls, mightn't the collapse trigger plate vibrations that will bring 'Martha' down, too?"

"I repeat my objection!" Badging was on his feet and waving his arms. "This hypothetical is highly improper. Your honor, there has been no credible testimony that the George tower is any danger whatsoever."

"Ms. Sena has so testified!" insisted Potts.

"No *credible,* I said," reiterated Badging.

"Gentlemen, gentlemen, calm yourselves," rumbled Roule. "I agree with you, Mr. Badging. We'll strike the hypothetical, question and answer." The dark eyes gleamed down at the visiting lawyer. "Mr. Potts, the court will take judicial notice that strong ties of love and affection existed between George and Martha Washington, and indeed that, when he died, she soon followed. However, these bonds and identities do not carry over into modern cantilever design, however named."

Potts sighed. "Nothing further, your honor."

As he sat down, the woman passed him a scribbled note: "The computer panel is rigged. The judge controls it by buttons under the bench."

Probably true, thought Potts, but how did she know? Did she have strange electronic sensors in her brain and/or body? He nodded to her, then wadded up the note. And there was another puzzle. Since they were going to lose on the merits, why did the judge have to resort to dirty tricks?

After a lunch break Badging put on several more witnesses: a real estate appraiser who testified to the value of the condemned parcel; a bridge engineer who swore the structure design met all codes and was absolutely safe; a gentleman from the U.S. State Department who explained the protocol for selection of sites for embassies and consulates and who denied that the Department had any record of a foreign embassy on Sena Rock; a psychiatrist who refused to look at Sena while he testified that she was ruled by delusions and hallucinations.

Potts objected to one and all, for various reasons, without avail. The green light for admissibility lit up on each and every occasion.

Late in the afternoon Badging said, "That's my case, your honor."

"Yes. Hm. A very thorough presentation, Mr. Badging." The judge peered at the clock at the back of the courtroom. "It's six o'clock. Will you have any rebuttal, Mr. Potts?"

"I'd like to consult my client about that, your honor. I've had no opportunity—"

"You had a whole hour at lunch to talk to your client, Mr. Potts."

The lawyer stifled a groan.

"But," said the judge, "this is a generous court. We are above all, fair."

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The sardonic eyes glinted down at the lawyer. "I'll give you the weekend. Court adjourned until ten o'clock Monday morning." With a swish of his robe he swept from the dais.

"All rise . . . "

Potts felt a great relief. It could have been worse. At least now he had a couple of days. Weekends are gifts of the gods to lawyers in mid-trial. A time for research, talking to the client, hunting witnesses, finding that crucial bit of data or that milestone citation to spring on Monday. Forty-eight hours to recover from Friday's trauma.

He closed his attaché case carefully. "We have to talk," he told his client.

"Where are you staying?"

"At the Colonial, if they're still holding the room."

"Drive over behind me. I know where it is. There's a good restaurant across the street."

3. Dhorans

She insisted on going up to the room with him. As they stepped inside, she held her finger up to her lips. He looked at her in wonder. She walked over to him and whispered into his ear: "Bugged."

He nodded. Somehow it didn't surprise him. He fished around in his case, brought out a micro-cassette player, and placed it on the night table.

They left quietly, down the back stairs to the street.

"What's on the tape?" she asked as they walked into the rear of the restaurant.

"Some high entertainment. It'll keep the goons glued to their earphones for a couple of hours."

"Standard equipment?"

"I never leave home without it. What's good to eat here, Sena?"

"I like the trout. They don't take them from the river anymore, of course. Probably flown in from Spain or Alaska."

He ordered quickly. "We must talk. Forgive me if I'm blunt and tactless."

"Go ahead."

"How old are you?"

"You heard me tell the judge."

"I'd like to hear it from you."

She would not look at him. "Everyone thinks I'm crazy. Do you?"

"No." (Chalk up one lie, Potts. But what could he say?) "Are you?"

"Sometimes I think I am."

"What are your earliest memories?"

"Is that important?"

"I can appreciate your reluctance." He shrugged. "A young friend once asked me, 'Should I put on my resumé that I have seen a flying saucer?' I told him, 'Don't admit it—to anyone—*ever!*' But since then, I've had second thoughts. Honesty has its points, too. Please answer, if you can."

"I've never told anyone before. Not even *him*." She sighed.

Him? Better not ask just yet. He waited.

"I came out of the Rock at sunrise," said Sena. "That's the first thing I remember. The great ship was there. Three or four of the People were standing around, watching me. I knew they had made me. They had copied an Indian girl of the neighborhood. I also knew they had given me much knowledge, and I knew what I was supposed to do to preserve the Rock. After a time they got back into the ship, and it made

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a soft hissing sound, and then it vanished."

"These People . . . what did they look like?"

"They floated . . . they pulsed . . . they vibrated . . . mostly they were balls of light . . . sometimes things stuck out of them, like coiling light rays . . . "

"Go on. What happened next?"

"That morning a herd of great horned creatures came down to the river to drink."

"Deer?"

"Much bigger. The giant bison, I think. Their horns were easily six feet across, point to point."

"Are you sure, Sena? The giant bison became extinct in North America about ten thousand years ago."

"That's what they were, though."

"How about horses? Camels?"

"Those too. And giant sloths. And big cats, what you call saber-tooth tigers. They're all gone, now."

Sandia fauna, thought Potts. All extinct by seven thousand B.C. "You were 'copied' from an Indian girl? Did you have much contact with the early Indians?"

"Not much. But they were there. They hunted the bison and the other hooved creatures."

"With bows and arrows?"

"This was before bows and arrows. But they had spears and were skilled with the atlatl—the spear thrower. And there were cliffs nearby—the Palisades, where Mr. York died. The early people stampeded the herds over the cliffs and took meat and hides down below. The cliffs were much steeper then."

"Why did your People select this particular site for the Rock?"

"It's one of the few places they could bring into focus with a matching plate on Dhora. The plates line up every two hundred years, and make sort of a bridge. Then they can cross over."

"Dhora?"

"Their world."

"*I see.*" *(He didn't.)* "*Why did they* make you a female?"

"I believe they thought the Indians would consider me less a threat. In this they were only partly right."

"Oh?"

"At first the Indians wanted to kill me, but then I showed them how I could sink down into the Rock, and after that they were greatly afraid of me. They called me Asenaapeeneniwa, Spirit-of-the-Rock. Later . . . much later, they shortened it to just plain Sena. They brought me meat, still hot on cooking sticks, and later little corn cakes."

"Ah, so you do have an alimentary system?"

"Of sorts. Not like yours, though. I can take it or leave it."

"Let's see if I understand. You're not a true human being. You're really a sort of alien artifact. And so is the Rock."

"That's true."

"And you're about ten thousand years old."

"Yes."

"The river, the town, the county . . . all named after you? Not the other way around?"

"Most improbable, isn't it, Mr. Potts?" She seemed grimly amused.

He sat there, staring at her, rudely, tactlessly. She looked back at him. Finally he took a deep breath. "Your story is indeed improbable. But I would like very much to believe you."

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"Then we are making progress."

"You and I, perhaps. But the case, no. There's no way we can stop the construction. If you're right, the Rock is going to collapse, and it'll take the tower with it. If you're wrong, the Bridge goes safely ahead. Either way, you lose. I can do nothing for you. I might as well go back home."

"Perhaps you should. It would be safer for you."

"York was murdered, wasn't he?"

"Yes."

"Why?"

"He found out that the judge owned a big share of the Bridge bonds. He had hard evidence. So go home, Oliver Potts. You can still catch the late flight."

"No. Not yet. In any case, I'm staying for Fenleigh's funeral, tomorrow morning. I can't stop the Bridge, Sena, but perhaps you can think of some small, possible thing I can do for you."

"Not for me, Oliver. But how about the men on the tower? There are two elevators on the tower; traveler creepers, they call them. The first thing Monday morning, ten men will go up to the top of the tower on one creeper. Then the second creeper will be loaded with girders—about two and a half tons, and then it will start up. As soon as it does, the Rock will disappear, the tower will begin to collapse, and those ten men must die. If you're really determined to do something for me, perhaps you can figure out a way to prevent those men from being on the tower when it collapses. Maybe if you explained all this to the judge, he'd order the men not to go up, at least temporarily."

"He'd never do it. He'd consider it an admission your case has possible merit."

"Perhaps you could talk to Mr. Badging?"

"He'd feel even stronger about it." Noting her concern, he added quickly, "But let me think about it."

"Yes."

"Now, we have to make plans. After Fenleigh's funeral tomorrow, I'd like to talk to you again."

"He was your friend?"

"We went through the university together."

"I'm so sorry."

As they left the restaurant, he asked, "What's that big brick building over there, across from the motel?"

"The County Sanatarium," she said dryly. "Maybe we belong there?"

"Not yet, not yet," he said absently. And now he remembered something he had been meaning to ask. "Earlier, you mentioned you hadn't even told *him*. Who was *him*?"

"George. George Washington, that is. We were sort of . . . friends."

"Oh." He looked across the street. The face of the main building was well-lit. Beyond the chain-link fencing and the big iron gate he tried to read the gold letters on the façade, but they were too far away. "Goodnight, Sena."

4. The Black Bag

As the burial crew lowered the casket into the dark empty rectangle, Potts talked quietly to Miss Joyner. "Did he take a retainer?"

"It's in the trunk of my car."

After the service was over they walked to her car together. She opened the trunk and helped him lift out a heavy black

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leather bag. He laid it on the gravel of the parking lot.

"What in the world . . . " he muttered.

"A lot of old coins," said Miss Joyner. "He was going to have them appraised, but he never got around to it."

Potts studied the bag glumly. The leather was ancient, smelly, and cracking in several places. He sighed. Fen had taken Sena's money, probably old pennies. From the weight, maybe even lead counterfeits. And now Potts was stuck with it.

He said softly: "What did he think of her? Of Ms. Sena?"

York's ex-secretary shrugged. "I don't know. I think sometimes he thought she was crazy. She told him the coins were counterfeit, but contained gold."

"Gold?" He lifted the bag again and fought off an urge to open it on the spot. "You don't think so?"

"I don't know. I'm just a secretary, Mr. Potts."

"And one of the best, Miss Joyner."

"Can I help you carry the bag to your car?"

"Thanks, no." He opened the car door for her and watched her drive away. Next week he'd have to help her wind up Fenleigh's affairs. Just now, he had other problems.

Inside his motel room Potts drew the drapes, chain-locked the door, and very carefully opened the bag. On the very top was a fold of ivory-hued fabric, which he took to be a coarsely-woven mix of linen and wool. He eased it back carefully.

Despite the dim lighting, golden sparkles rose up and dazzled him. He stared, unbelieving. He reached in and picked out a coin at random. He adjusted his spectacles, read the date, then closed his eyes for a moment, then opened them again and read the date once more. This time out loud, as though to convince his ears: "Seventeen ninety-five."

A 1795 gold coin. My goodness!

Rings a bell. In fact, two bells. The Mount Vernon Trust sent me that notice . . . a missing 1795 gold eagle. And Barton Badging. Barton, are you still looking for a 1795 gold eagle? Proof condition?

He replaced the coin and picked up another. Seventeen ninety-five. The next, seventeen ninety-five. And another. The whole bag? Shades of Blackstone! The bag must weigh at least forty pounds. Forty pounds of 1795's? Counterfeits, Miss Joyner had said? Sena, where did you get these?

He picked up the phone and got Catlin at her apartment back home. "I need information about old coins. Look in your access index. I'll wait."

She was back in a few minutes. "There are several sources."

"Top three?"

"American Numismatic Association, Professional Numismatic Guild, Inc., and National Coin Collectors. And guess who was past president of NCC?"

"Not Barton Badging."

"Yes Barton Badging. Mr. Potts. shouldn't this be on scramble?"

He smiled, but his mouth was in a hard line. "Don't bother just yet. Anything more on Badging?"

"He wrote a book, *Grading Guide for Eighteenth Century Eagles*. *And* he's an Associate Authenticator. He can look at your coin and give you a certificate.

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He's really into this stuff, Mr. Potts. Go on scramble, now?"

"No, not just yet. Access his book, get what he says about the seventeen ninety-five ten dollar gold eagle."

"Right here. Liberty head. Designed by Robert Scot. Minted at Philadelphia. Seventeen point five grams, thirty-three millimeters diameter, reeded edge. Ninety-one point six seven percent gold, balance copper." She paused.

"How many minted?"

"Five thousand, five hundred and eighty-three."

"What's one worth?"

"The best listed is MS-sixty-five, uncirculated, last auction at one hundred thousand dollars. Mint proof is better than that. Only one known to be struck, and given to George Washington for approval. Whereabouts unknown."

"Very good, Miss Catlin. *Now* we scramble." He placed the electronic device over the phone mouthpiece and waited for the whirring to stop. "You there?"

"Yes, sir."

"The room here is bugged, of course. No problem with that. I've got a cassette override on it. But the interesting thing is, I think we picked up a tag on the computer output as soon as we plugged in to the seventeen ninety-five reference. Can you check it out?"

"I'll try. Hold on. Yes, it's coming in. There *was* a tag. It was routed to Sena City. Somebody there is alerted every time the seventeen nine-five reference is pulled out. But Sena City is as close as I can get. No name. No phone number. Is that any help?"

"Oh yes indeed. Thank you, Miss Catlin. And goodnight."

Next call to Sena. "Please come over here as fast as you can."

Okay, Badging, he thought. You laid the tag on the circuit. You've got all the questions. Let's see if Sena has any answers.

As soon as she came in the door he showed her a written slip: "Room still bugged. I've put on Entertainment Cassette Number Two. We can talk softly."

He walked back to the leather bag on the floor and lifted the covers. "An extraordinary collection, Sena."

"I trust they are adequate for the retainer?"

He smiled without humor. "I have been given to understand that one coin—just one—would bring in excess of one hundred thousand dollars. And how many are here?"

"Originally there were eight hundred, but over the years I had to spend twenty, maybe twenty-five."

"All identical?"

"Yes."

He grappled with the mental arithmetic. Nearly eighty million dollars. Of course, not that much. After the first few got on the market, the price would begin to drop.

"Oliver," she said gently, "don't even think about it. I told Fenleigh and now I tell you: they're counterfeit."

"Counterfeit. Oh. I see."

"No, you don't see. It's still forty pounds of coin-grade gold bullion, worth about three hundred thousand dollars on the New York market. Of course, there may be a slight problem with the copper content."

He had a feeling he shouldn't ask. "Tell me about the copper."

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"They had to program for copper, to conform to the Philadelphia mint formula. Copper is added to coin gold for hardness, you know."

"Go on. There was a problem?"

"We didn't pay much attention to isotopes in those days. Native copper is a mix of Cu-sixty-three with about twenty-nine percent Cu-sixty-five isotope. Our Cu is all Cu-sixty-three."

"Is the lack of Cu-sixty-five detectable?"

"There are ways. First of all, though, you have to know to look for it."

"Would a professional coin authenticator be likely to look for Cu-sixty-five?"

"No. It would be outside his level of expertise. Anyway, he wouldn't have the equipment."

"Interesting." Something else was bothering him now. "Mr. York's secretary said he took your case on contingency. If he lost, you didn't pay. Is that so?"

"Yes, that was our arrangement."

"But you *did* pay. These coins certainly have bullion value, at six hundred dollars an ounce. If we lose, am I supposed to return the coins?"

"No, that wouldn't be necessary. Let me explain. It's true, the coins have bullion value just now. On the other hand, they're part of the Rock. If the Rock collapses, so do they."

Oliver Potts suppressed a moan. "So we're back to *that*. If the Rock goes, they go? Poof?" He pantomimed blowing a feather from his palm. "Like that?" He looked at her with raised eyebrows.

"Poof, like that."

"Hard to get more contingent than that."

"That's true."

"But *how* did you make them, Sena?"

"Actually, Oliver, *I* didn't make them. *They* made them for me. They made them on a matter copier."

"*They* . . . ?"

"The People who made the Rock, and who made me. The Dhorans."

(Was he beginning to *believe?* Potts, *stop!* Remember that big red brick building across the street, with the chain-link fence.) He mused aloud: "And they made the Rock to be the Earth terminus of a bridge—*their* bridge. That's kind of funny, isn't it?"

"You're not laughing, Oliver."

He smiled wanly. "Your original coin was fresh out of the Philadelphia mint when your People copied it. That was two hundred years ago. Have they been here since?"

"No. They're not really due for another couple of months."

"Where do they come from? Where *is* Dhora?"

"Dhora is the second planet of Alpha Centauri."

He had to think about that. "They've done this on other planets?"

"I think so, though I've never seen the other places."

"*Why* do they do it, Sena? What do they want?"

"The Rock is several things. Besides being a bridge terminus, it's also a weather station. It records interspatial dust, cosmic temperatures, interstellar radiation, that sort of thing. They need to know all that, because they have great interstellar commerce. Also, the last several times they were here, the Rock

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was a big trading post with the Indians. The Dhorans bought beaver furs with knife blades and beads and blankets."

"The beavers are long gone."

"I know; so are the Indians."

"Nowadays, I doubt we'd have anything they'd want."

"I don't know. They're great traders. They'll find something. You have orchids, butterflies, rosewood, seashells. They can give you a list."

"What would they offer in return?"

"Technologies."

Of course. But none of it was going to happen. Not now. "And you, Sena, why are you here?"

"I try to keep the Rock clear, at least for the two-hundred year entries. Up to now, it's been just a question of clearing away leaves and storm debris. This is the first time the Rock itself has been threatened. As a preserver I'm not doing so well, am I?"

"You're doing fine, Sena." He didn't want to believe. Why was he doing this to himself? He shook his head vigorously, as though to shatter the fantasy. But it didn't shatter. It stayed right there. "The master coin, Sena, where did *it* come from?"

"*He* gave it to me. George."

"George *Washington?*"

"Your first president."

"He was just passing by? In seventeen ninety-five?"

"There was more to it than that. Don't you read your history? They were giving him hell about the treaty John Jay had negotiated with the British finally to end the War and define all the boundaries and commercial rights. The proposed treaty was tearing the country apart. Some told him, the British are stealing us blind, don't sign. The Senate said, sign immediately, before they change their minds. He had to think, weigh all the pros and cons. He got away to Mount Vernon, but they followed him there. And then one weekend he really disappeared."

"He came here?"

"It wasn't the first time. We were . . . old friends."

Potts found himself blushing. "I understand."

She reflected. "That summer, when he was still in Philadelphia, the Director of the Mint, David Rittenhouse, gave him that first gold eagle, struck specially for George's approval. George gave it to me. The Dhorans used it a few weeks later to make the eight hundred copies."

Oliver Potts found himself dreaming. George Washington, General of the Armies, First President, Father of his Country, Model of Morality and Rectitude, easing his fading days with this beautiful woman. Ah, me. "Go on," he said.

"Well, he went back to Philadelphia and signed the Treaty, and so your United States got off to a good start. A few years later he was dead. Do you believe me, Oliver?"

He didn't answer immediately. He was staring at the leather bag. On the near side, something in mottled gold letters. "G.W." he whispered. "His saddle bag?"

"He forgot it. Today, I guess you'd call it a Freudian wish to return. It made a good coin case."

Potts stared at the bag a long time. Finally he said, "I can't stop the bridge." He pushed at the bag with his toe. "Even with all this."

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"No, I guess you can't."

He was frowning, and concentrating. An idea was trying to form. If he could just get it to crystallize . . . "Those men up there on the tower. When the next load of girders is brought up, the cantilever collapses, and they will all be killed." (After he said it, he realized he was not asking a question, but making a statement.)

She watched his face with great interest.

He continued: "And 'George' collapses whether or not the workmen are out on the cantilever arm."

"Yes."

"So it would be a humane act to keep the workmen off the tower until the elevators go up?"

"That's what I've been telling you. But you said you couldn't get an order from the judge—"

"Not the judge. Badging. Maybe." His idea was now almost complete. There was just one more thing. "Is it possible to show that these coins were in fact made in 1795?"

"Yes. By measurement of the copper oxide coating, x-ray apparatus is required, but it's readily available, and the test is simple and non-destructive. It's quite similar to Bragg x-ray crystal analysis."

"Would Badging be likely to have the equipment?"

"I'm sure he would." She studied him with growing surmise. "You have hidden depths, Oliver."

"Why thank you." He beamed in gratitude. "I could be a real S.O.B. if I put my mind to it. I'll call him now."

A few minutes later he said, "He's home, and he's expecting me."

"Just you?"

"I want to talk to him alone. A thing is going to happen that you shouldn't watch"

"You're the doctor."

"Lawyer."

5. The Coin Room

Barton Badging's eyes flicked from Potts's face to the bag he cradled in his arms. He stared at the bag, speechless.

(He's our chief bugger, thought Potts. Of course, the judge is in on it, too.) "May I come in, Mr. Badging?"

"Oh, of course, of course. I was a bit startled, that was all."

(So you were; but you haven't seen anything yet.)

"Let's go down to the coin room," said Badging. "Bit more private. Do you collect, Mr. Potts?"

"Not really. Don't know a thing about it. We are aware, of course, of your stature in the field. As a matter of fact, that's why I'm here."

"Not about the litigation?"

"No." (Although we may get around to it.)

"Down these stairs, Mr. Potts. Hold the rail. Can I help you with that?"

"Oh, I think I have it."

"You can put it on the table."

"Yes, thanks." Potts looked about the room in genuine appreciation. Glass cases full of coin trays lined the room. Coins were framed in collections that hung from the walls like carefully lighted paintings. His host was indeed a serious collector.

Badging's eyes never left the black bag. He wet his lips. He fingered a necklace strung with odd-looking beads.

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(Let's drag it out a bit, thought Potts.) "Interesting necklace," he said.

Badging's head jerked. "Oh. You mean this. It's Iroquois wampum. Very old. Made about sixteen thirty-seven, of shell bits, very carefully cut and polished. Once used as money, legal tender, six white or three purple were worth one English penny." Badging kept his eyes on the black bag, but now he let out a long breath and relaxed a bit. "People don't really appreciate money, Mr. Potts."

"No."

"There's something special about the sight and sound of bright jangling coins. To have, to look at, even to smell."

"Yes, of course." Potts looked across the room at a wall covered by bookshelves. "And to study?"

"And to study. I love books about money, ancient money, modern money. I've written a couple myself. And I have scrapbooks of tours through American and foreign mints."

"That all sounds pretty general. Do you have a specialty?"

"Of course. All serious collectors have a specialty. Mine is Americana, seventeen hundred to eighteen hundred."

"Fascinating, Mr. Badging. However did you get into *that?*"

Badging put his hand out and caressed the bag gently. He said, "It started years ago, when I had just hung up my shingle. I settled an estate, which, alas, turned out to be bankrupt. The widow paid me with the deceased's strong box, 'inherited as is from great-great-Uncle Philip.' I broke it open. One or two gold coins. Hardly worth melting down. And there were several other items. A great disappointment. Still, being a prudent man, I had the batch appraised. The report was a real surprise. There were Spanish reales, Massachusetts Willow Tree shillings, Maryland pennies, Virginia halfpennies, New Yorke tokens, Pitt farthings . . . The appraiser made me a six-figure offer on the spot. I never regretted turning it down. Oh, I may have had one small bad moment as I drove home from the goldsmith's: was I ethically bound to tell the widow about the true value? No, I decided."

(And, thought Potts, your conscience has never troubled you since.) He said, "I see the picture, now. It's inspiring, when we realize that from that nucleus, your present collection has grown. And of course, along the way, you probably became an international expert in early Americana?"

Badging nodded. His hand was on the leather cover. He was about to open the bag.

(It's time, thought Potts. He's going crazy.) "Plastic gloves?" he said quietly.

Silently, Badging opened the desk and brought out two pair. They put them on.

"Go ahead," said Potts. "Open it."

Badging did. With trembling hand he picked out one coin, looked at it, and almost dropped it. He laid it beside the bag and did several things: his eyes glazed, he put his hands under the table, and he stopped breathing.

Potts had watched bird dogs behave quite similarly before they settled into a rigid point. Just don't let him faint, he thought.

Slowly, Badging returned to life. His eyes opened. He whispered: "How many do you have here?"

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"About seven hundred and seventy-five, so I'm told."

Badging thought a moment. "About forty pounds?"

"Yes."

"All identical?"

"Yes, I think so."

The coin expert closed his eyes again. They opened. This time his hands were on top of the table, but they were still trembling. "Mr. Potts, would you permit me to take one of the coins into the back room for a closer inspection? I assure you—"

"Oh, you don't need to do that, Mr. Badging. I'm convinced they're counterfeits. I'm sure your tests will show that. That's partly why I'm here."

"Counterfeits?" Badging's cheeks sagged as the blood began to drain away.

"It stands to reason, doesn't it, Mr. Badging? Nearly eight hundred 1795 gold eagles still in mint proof condition after two hundred years? I'm no fool, sir. And neither are you. The problem is how to handle the stuff as bullion."

Potts watched the collector's eyes. I would make a good mind reader, he thought. Greed makes a man deaf, dumb, and blind. He thinks he knows a genuine seventeen ninety-five as Da Vinci knows Mona Lisa, or as Parsifal knows the Holy Grail. I can read him. Just now he's thinking that copper promotes slow oxidation on uncirculated gold coins. The coating is only a few microns thick and it's invisible to the naked eye. However, it is detectable and measurable by techniques well within the scope of his skill and equipment.

"Go ahead," said Potts gently. "Prove it to yourself that they're counterfeit."

"Yes. Thank you. Please excuse me." Badging picked up the coin with plastic-sheathed fingers and disappeared into the alcove behind him.

Ten minutes later he was back. He wouldn't look Potts in the eye.

"I'm sorry," said Potts sincerely. "I told you they were counterfeit. Remarkable imitations, though. Now then, could we talk about the bullion value?"

"Bullion . . . ?" It seemed difficult for Badging to concentrate.

"There is a small problem," explained Potts delicately. "Possession."

"Possession . . . ? Oh, you mean possession of counterfeit coins?"

"Yes. Eighteen, U.S.C. 485. The Secret Service may not take kindly to possession of nearly eight hundred counterfeit gold coins. They'll have to be melted down."

Badging turned pale. "Melt . . . ah . . . no . . . well . . . "

Potts watched this with interest. He smiled. "That raises another difficulty. Because of the legal problems, it would have to be done under conditions of great discretion. My client doesn't know any goldsmiths; nor do I. But we thought you might."

The older man's face suddenly shone with a great light. "I know . . . one or two." He coughed delicately. "There would, of course, be a fee."

"My dear Mr. Badging, you don't understand. She wants to be completely rid of the coins. She wants no bullion back. She's simply trying to steer clear of the law."

"*She?* Ah! Madame Sena?"

"Yes."

"The crazy woman."

"So they say."

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"What do *you* think, Mr. Potts?"

"She's certainly different."

They looked at each other. Badging sighed. It was coming together. Things said, plus things not said. "What does she want?" He put it almost petulantly.

"Thirty thousand dollars, plus a little favor."

"The money's reasonable. But I can't throw the case, Potts."

"No, of course not."

"So what's this 'little favor?' "

"Monday morning, when the first two loads of girders go up into the west cantilever tower—'George,' they call it—ten men will be at the top waiting with rivet guns. My client believes the tower will crash as soon as those elevators start up, and that those ten men will be killed in the crash. She requests that the men stay off both towers—east and west—until the elevators move on George. After that, you can do anything you like."

"Huh? You mean, the men on both George and Martha wait until the girders go up on George?"

"That's it."

"That's all she wants?"

"Plus the thirty thou, of course. At this point, she's simply trying to save lives. Both towers may be involved because of internal strains in the underlying continental plate."

"*If* George falls, you mean," said Badging.

"*When* George falls," said Potts firmly.

"Oh God. You too?"

"Me too."

Badging shrank back in his chair. Then he looked at the mythic leather case, and back to Potts. He exhaled slowly. Potts relaxed.

Badging rubbed his chin. "Insanity aside, Potts, I'd have to persuade the on-site engineers. They'll howl, you know. They'll lose fifteen or twenty minutes, getting the men up there after the beams. No rational explanation. There'll have to be pay-offs. Not sure I can swing it."

Potts smiled. "We have faith in you, Badging." He pushed the case toward the other.

His host laid possessory hands on it. "I'll make out a check."

"Do we want to burden the record with a piece of paper?"

"Oh. Ah, no, of course not. Cash. You want it now?"

"That would be fine."

Badging went over to his wall safe and came back with three bundles of one-hundred-dollar bills. "You want to count it?"

"Certainly not, Mr. Badging. You want a receipt?"

"No need for that. I am holding the bag."

Potts smiled. "Why so you are. Got time for an anecdote?"

"Well, all right."

"It's about that very bag. Outrageous rumor has it that the Continental Congress gave the bag to Washington when he bade farewell to the army at Annapolis, in seventeen eighty-three. I imagine a thorough examination by a competent antiquarian would show the leather is no more than twenty or thirty years old. Those gold initials are probably actually for some chap named Gerald Whipple, or something like that. Are you all right, Mr. Badging."

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"Yes," said his host faintly. "It was listed as missing after his death at Mount Vernon in seventeen ninety-nine."

"What? What was missing?"

"Nothing. Nothing."

Potts arose and pushed his chair under the table. "Oh, there's one thing . . . "

Badging looked up. His mouth twisted into harsh lines. "The catch," he said bitterly. "*Now* we get it."

"The catch," agreed Potts amiably. "I'm informed the coins carry a curse. I promised Sena I would mention it. If the Rock collapses, the coins vanish." He smiled broadly.

They looked at each other. After a moment Badging smiled too. Then he began to chuckle. Then he leaned back and guffawed. Tears ran down his cheeks. Finally the laughter died away. Ignoring his guest, Badging leaned forward and clasped the leather case to his chest and began to shower kisses on it.

"I'll let myself out," whispered Oliver Potts.

6. Sunday at Sena's

Potts accepted Sena's invitation for Sunday dinner.

As she ushered him in, she said, "Actually, Oliver, I should be giving a great festive party in your honor, just as in the old colonial days, when someone important came to visit." She smiled at him as they walked into the dining room.

"That's hardly indicated, Sena."

"You're right, of course. But at least we can have the fixin's, just as they had in the old time: soup, river oysters, fish, roast turkey, chicken, duck, goose, beef, mutton, molded jellies, plum pudding, pies, cakes, tarts, spiced punch . . . "

He stared at her, appalled.

She laughed merrily. "Small wonder the men had gout and the women the dropsy. No, Oliver dear, actually, we'll have just a little dab of different things, all over on the side table. It's buffet style tonight. Take what you want. Just soup and crackers, if that's your preference."

They got trays and loaded up.

She poured him a tumbler of foamy pinkish liquid. "Sillabub," she explained. "Wine and cream. Old plantation recipe. The lipids in the cream facilitate absorption of the alcohol through the stomach lining. Knocks you on your ear."

"Like a double martini?"

"More like a triple."

Great, thought Potts. Oh well, maybe we can finally get to the bottom of things.

As they sat at table, he noted the strange music from the far side of the room.

She explained. "That's a 'player' spinet, otherwise genuine for the period. The strings are plucked by little quills."

"What's the tune?"

"That one is *High Betty Martin*. Next you'll hear *Old Father George*."

"G.W. again?"

"No, no connection. Although they *were* very popular in his day, and he *did* love to accompany me on the fife when I played the spinet."

"I didn't know he played anything."

"He wasn't very good at it, but he could pat his foot and keep the rhythm."

"Sounds like a good life."

"It was different. I once had a mu-

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seum room, where I kept things characteristic of the period. But it all went into storage when I had to move my house."

"What's your house made of?"

"Not wood, or stone, or plastic. It's the same stuff as the Rock. When the Rock goes, so will the house, and everything in it."

He looked around. "Lots of tapestries."

"Actually, those are rugs. In colonial days they were too valuable to walk on. We hung them on walls and put them on tables."

She was in a reminiscent mood. It worried him. He had once observed the same mood in a man awaiting execution. "How did you get along with the early colonials?"

"Pretty well, until they caught religion. Then they decided I was a witch and should be burnt. That was about sixteen ninety. The town fathers chased me out here with torches and blunderbuses. But as they watched, I sank into the Rock. The preacher cursed the place in an elaborate ceremony, and then the warders stripped my house bare and tried to burn it. But it wouldn't burn. I stayed in the Rock for years. When I came out again it was seventeen twenty-five, and all was forgotten. Tea had come to the colony. Cups from France, no handles. When you went to a tea party you brought your own cup and saucer, and you sipped daintily from the saucer, not the cup. It's all different now."

"Did going into the Rock have any ill effect?"

"It was boring. And I picked up a little radioactivity. But it had a fast half-life and soon faded. I haven't been in the Rock since I emerged in 1725. There's no need, anymore. I'm quite harmless, now, Oliver. You have a higher radiation level than I do."

"Weren't they suspicious when you never aged?"

"Oh, I learned how to handle that. I aged with make-up and gray wigs. When I got *very* old I went away, 'died,' and returned as my 'niece,' to inherit the house and the Rock." She pointed to a framed portrait on the wall. "See over there? I was a 'grande dame' when Stuart painted me in seventeen eighty-two. That big white wig was quite the rage. Cost me four guineas. I slept on a headboard for several nights to preserve my coiffure."

Potts peered at the painting. "Really well done."

"You like it? George thought so, too. He developed into a fair connoisseur."

"He had excellent taste," agreed Potts.

"Some of today's things he would have liked; some not. He was a great dancer. He'd ride miles to a ball. Would you like to dance, Oliver?"

"I'm not so good at the modern steps . . . "

"I'm not either. A colonial favorite, perhaps?"

"Fine."

"*The Rolling Hornpipes*. I take the spinet, he accompanies on the fife. What he lacked in talent, he made up in spirit."

"Huh?"

"George and I played together, back in seventeen ninety-five. I made a life-size holo at the time. I never played it back for him. I didn't think he'd un-

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derstand.'' She walked across the room and pressed a switch.

And there they were. The general, standing tall, lips puckered, blowing into the little silver cylinder. Sena's fingers were dancing nimbly over the spinet keyboard. She was looking up gleefully at her musical guest.

Potts jumped up as though stuck with a red-hot needle. ''Jesus X. God,'' he whispered. The tall white-haired man was, save for a towel draped around his middle, totally naked.

The lawyer emerged slowly from his paralysis. He found himself thinking of Hawthorne's famous comment: ''Did anybody ever see Washington nude? It is inconceivable. He had no nakedness, but I imagine he was born with his clothes on, and his hair powdered, and made a stately bow on his first appearance in the world.''

That's very strong sillabub, thought Potts.

''Come,'' said Sena. ''Let's dance.'' She took his hand.

''But—''

''I'll explain later.''

And so she led him into the sprightly gyrations of a vanished time to music provided by the Father of His Country.

It came to an end. The holo shut off automatically. The vision of lost centuries vanished.

Potts wiped a sleeve over a damp forehead. ''Well?''

''He was out this way for the first time in seventeen fifty, surveying for Lord Fairfax. He was only eighteen, though he looked older. Oh, how handsome he was, with his thick red hair, his fine shoulders, his slim waist. We were lovers, Oliver. There are still some letters spread around in the archives, where he mentions me. I was his 'Low Land Beauty.' He capitalized everything. I was not the only woman in his life, but I think I was the first. Sally, Martha, Eliza, all were later.''

''He returned?''

''Yes, just that one time, in July seventeen ninety-five. The country was in a horrible mess, the worst since the Revolution. The Jay Treaty was supposed to bring peace with Britain. If we didn't sign, Britain would declare war. If we did sign, we'd face civil war at home. John Jay was hanged in effigy. Alexander Hamilton tried to defend the Treaty and was stoned. The house of the British minister was insulted by a mob. The British flag was dragged through the streets of Charleston and burnt before the doors of their consul. There was nowhere George could turn for objective advice. Knox and Hamilton had resigned from the cabinet. Only Randolph remained, and he was suspected of treason. And besides the Treaty, George had to go back to Philadelphia that fall and give his Annual Report to Congress. 'Sena,' he said to me, 'what the hell am I to do?' 'George darling,' I said, 'just now the main thing is to keep the *status quo*. Hold off war at almost any cost, at least for fifteen or twenty years. Let this lusty young country grow rich—able to defend itself—against the British, French, Spanish, the Barbary pirates, everybody.' 'But the *South*,' he said. 'They want to ship cotton to Europe, but under Article Twelve of the Treaty they can't, because it would compete with cotton from the British West Indies. The South will scream if I sign.' 'Look, honey,' I said,

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'rewrite the West Indies Article, *then* sign the damned Treaty, and get it over to London before Congress reconvenes. The British will sign. Believe me.'

"I remember how he looked at me. He refused to wear his spectacles, so he couldn't really tell whether I looked old or young. Actually, at the time, I was made up to look about forty, but with a nice figure and a good complexion. I applied more pressure. 'George, dear, the British don't want any trouble from us. They've got enough right there in Europe. The French have a bloody revolution in progress. A young artillery captain named Bonaparte has just run the British out of Toulon.' 'You are well informed, my girl.' 'I read the papers, general.' He said, 'And I suppose you have some thoughts about my Seventh Report to Congress?' 'I have indeed. Tell them—and the country—they never had it so good. Wayne's victory over the Indians at Fallen Timbers has brought peace in the southwest. In the northwest the Jay Treaty will bring peace with the British. Also, the Treaty will frighten the pants off the Spanish, and they'll concede commercial rights the full length of the Mississippi. Our population continues to grow, and the country to prosper. New canals and new roads are opening everywhere.' George stared at me. His mouth was wide open, and I could see the silver mechanism on his false teeth. 'Well by God.'' he said. 'You're right! Anything else?' 'My friend,' I said, 'you rode in here shivering even in your long underwear. I remind you it's the middle of July. Even with all the doors and windows open, it's still quite warm. And now you've stopped shivering and you've begun to perspire. I'd be pleased if you would let me launder your linen.' '' She stopped and looked at Potts. "I gave him a towel.''

"Yes. That's where we came in.''

"He just needed a rest. Just a couple of days . . . and nights.''

"Yes.''

"Actually, I think he forgot some of his linens.''

Potts thought about the coin packing. He nodded.

Sena said, "He went back to Philadelphia, signed the Treaty in August, and gave his State-of-the-Nation in December. Of course he had to put it in the stilted formal language of the day: 'I invite you to join me in profound gratitude to the Author of all good for the numerous and extraordinary blessings we enjoy.' But there it all was.''

Potts was thoughtful. "And it all came about just as you predicted.''

"Almost exactly. But nowadays, who cares?''

"*I* care.''

"You're a good soul, Oliver.'' She took his hand and led him to the bay window, where the full moon was shining in, sinking slowly but measurably just over the horizon, and just behind the tower, giving the illusion that a colossal skelton was rising up over the edge of the land. They could almost hear a victory shriek.

Potts felt Sena trembling. "Your people will come for you,'' he said.

"No, I don't think they care. I'm not really real, you know. I'm just a figment of my own imagination.''

"They care, and they'll come.''

"Even if they want to, I'm not sure

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they can. The gate doesn't open for another sixty days."

"This is an emergency. They'll do something special. They'll be here." He held her against him.

"Keep talking," she said. "Tell me how they will come."

"A great big white ship, rockets blazing, will sit down on the courthouse lawn—"

"No, no ship."

"Well, okay, no ship. We're in court, the judge is in the very act of handing down his decision, when suddenly the room is filled with this blazing radiance. It means their bridge has joined up. They call to you. You're not sure you want to go. You explain to them, you want to stay with me, to talk, and dance, and make love. They say, Sena, you *can't* stay. You *must* come with us, for we love you, and we have come a long way for you. You give me an agonized backward glance, and I think for a minute I might go with you. But we both know it wouldn't work. And the next moment you are gone, and the light is gone."

"And the bridge, and the Rock, and my house and everything in it. And the coins."

"Everything. Judge Roule is going to be a mite upset, not to mention Barton Badging."

"When I die I would like to dream. I will dream of you."

"Sena, stop talking like that. You're not going to die."

She ignored him. "But I don't know how to dream. I sleep when I want to, but I don't dream. I don't know how. It's a thing that only you humans do. If I could dream, I couldn't really die, could I?"

He thought, *Somnio, ergo sum*. I dream, therefore I am.

"Perhaps," she said moodily, "it would have been better if I had never met you. It would have been much easier to die. I would have had no regrets. It was cruel of you to come."

"Now you are reasoning like a woman."

"Am I, really? A genuine flesh-and-blood woman? Perhaps I'm changing into a human being. You know, just as Pinocchio changed into a real live boy. Then I'd be safe, wouldn't I?"

He thought of lines from Andrew Marvell. "The wanton troopers riding by / Have shot my fawn, and it will die." He said, "You're already safe."

"You can spend the night, can't you?"

He squeezed her hand.

Several hours later, as he was drifting away in sleep, he managed to rouse himself. He tapped her on the shoulder. "Are you awake?" he whispered.

"What is it?"

He hesitated. Still, something had been nibbling at the analytic lawyer-lobe in his cerebral cortex. Out with it, Potts. "Sena, do you remember your radiation level in 1750—when you first met *him*."

In the darkness he sensed her wakening astonishment. "It was still pretty high. George may have picked up several hundred rem. Oh, my . . ."

He tried to recall the relevant numbers. Yes, recommended maximum dose for the general public, one-half rem per year.

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"I sterilized him, didn't I?" she murmured in a very small voice.

"Go to sleep, Sena." (It's all ancient history, now.)

He lay there thinking. She *had* sterilized the youthful George. And since he could not have sons of his own, the young officers of the Continental Army became his sons: Hamilton, Lafayette, Greene, Wayne, Fitzgerald, Benjamin Lincoln . . . All of them. Small wonder he could dissolve mutinies with a gesture. Small wonder the men in epaulettes wept when he bade farewell at Fraunces Tavern. And as President he adopted the entire population as his family. Of *course* he was the Father of His Country—which he would never have been if he had had children of his own body. So curious the chain of causation! This woman, lying here beside me, made a great man greater, thereby winning a long and desperate war for independence, and ensuring the successful birth and infant years of the new nation. Without you, "Low Land Beauty," we might still be vassals of Great Britain. Or worse.

And so thinking, he smiled and went to sleep.

6. Case Dismissed

The courtroom, three minutes before ten.

He felt her knee touch his under the table. He realized at once the contact was not meant to be seductive. Sena was seeking reassurance. He reached over and patted her hand.

Then he looked up. Badging was standing by the table, looking about the area nervously. "Potts, just a quick question about the coins." He added diffidently: "If you have a moment."

"Sure, Badging. You want to back out of the deal? No problem. Here's—"

"No. No, nothing like that. But the coin wrappings. They look like long underwear, homespun linen, as a matter of fact, for a rather tall man. Do you know anything about them?"

"All I can do is repeat the tradition. George rode off without his drawers. Old wive's tale, Badging. Absolutely nothing to it."

"Yes, of course. Thank you, Potts, oh thank you, thank you." His face was glowing. He returned slowly to his table.

Glad I can bring a bit of cheer to you, thought Potts, even if it's only temporary.

"All rise!" intoned the bailiff. "This honorable court is now in session. Honorable Maximilian Roule presiding. *Sena versus Bridge Authority.*"

Roule swept in, glared around the courtroom, then sat down and glared once more, this time at Plaintiff and her counsel. "Any rebuttal, Mr. Potts?"

"Yes, your honor. I'd like to show some holos."

"Of what?"

"Various bridge collapses. How they came about. What caused them."

"How is that relevant here, Mr. Potts? The conditions are not the same at all."

"The Quebec bridge *is* quite similar, your honor. Bedrock under the south cantilever was unstable. The rock dropped one-quarter inch. The cantilever weighed twenty thousand tons, the same as the cantilever in issue here. The center span in the Quebec bridge was

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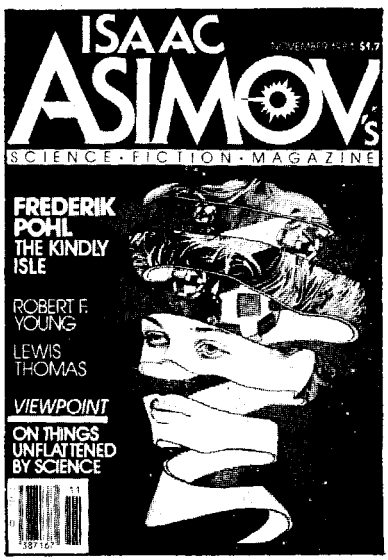

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nevertheless installed—some five thousand tons. Whereupon the whole bridge collapsed, killing a number of men."

Badging was on his feet. "Your honor!"

"Mr. Badging?"

"Plaintiff insists that another five thousand pounds of girders on our western cantilever is enough to overload the underlying greenstone, causing the rock to collapse and the tower to fall. Now, Defendant does not agree with Plaintiff's assertion of human risk. Not one whit. Nevertheless, out of the boundless goodness of his heart, Defendant has agreed to clear men from both towers while the next load of girders is going up on the west tower."

Roule scowled at Potts. "That will have to satisfy you, Mr. Potts. It's a very generous concession; Defendant has no obligation to make it. I hold your proposed holos inadmissible. Anything further, Mr. Potts?"

The visiting lawyer sagged a little. "No, your honor."

Roule smiled at him coldly. "Well, don't look so hang-dog. You did fine, considering there was nothing you could do. Don't sit down just yet. Mr. Badging?"

"Yes, your honor?"

"Since Mr. Potts had no rebuttal, you have no surrebuttal. Now, Mr. Potts, back to you. Do you have a closing statement?"

"Yes, your honor." He began slowly. "First, this court is without jurisdiction in the subject matter of this case. Sena Rock is the territory of a foreign country, namely the Dhorans, an extra-stellar people. It was acquired by them by treaty with the Indians, thousands of years ago. That treaty was automatically assumed by the United States when it assumed sovereignty over the Rock. Foreign territory cannot be taken by eminent domain, but only by war or treaty, or abrogation of a treaty. None of these things have occurred."

"Just a minute," demurred Roule. "You're familiar with 33 U.S.C. 532?"

"Yes. It gives the states and state-authorized bodies power to acquire property for bridges. And I presume your honor is familiar with 33 U.S.C. 531, which says 532 doesn't authorize the construction of any bridge that would connect the United States to any foreign country."

Roule rolled his eyes upward. "There you go again, Mr. Potts. You persist in thinking the Rock was the terminus for a bridge connecting the United States with outer space?"

"Yes, your honor."

"Mr. Potts, do you realize that the County Sanatarium is just up the road?"

"I am aware of it, your honor."

"Anything further, counselor?"

"One more point, your honor. The case presents a corollary question. In taking the Dhorans' Rock, this court has taken property without due process of law, in violation of the Fifth Amendment to the Constitution. There is thus a second federal question. With all due respect, your honor, this case should never have come to a state court. Only the federal courts have jurisdiction. Thank you." He sat down.

"And thank *you*, Mr. Potts, for a most original presentation. Mr. Badging?"

"Your honor, at the beginning of this trial, I moved to dismiss. Following the

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completion of Plaintiff's main case, I renewed this motion. I now renew once again."

"Before I decide your motion, Mr. Badging, I have some comments about bridges, and especially their construction and design. Actually, design has improved to the point where collapse is pretty much a thing of the past. Engineering skills have improved. Materials have improved. The designers autopsied their catastrophes, and they learned." The judge seemed to be in great good humor. "The big changes came in the late nineteenth century, when the bridge builders were trying to figure out how to handle the weight of bigger and bigger trains. Granted, they had a lot to learn. For in the decade eighteen seventy to eighty, four hundred bridges collapsed. But that sort of thing is all in the past. Bridges are no longer dangerous. Today we understand the basic principles of design.

"But of course, these are generalities and do not address the particulars of Mr. Badging's motion. To do that, we must refer to the evidence of record. And here we encounter a very basic threshold question, which sounds in the law of evidence, to wit, what weight are we to give to the sworn testimony of a witness who claims she is ten thousand years old, that she was made by creatures from outer space, and that Sena Rock is about to collapse. I say she is either lying or insane, or both, and that all of her testimony is therefore to be ignored."

He leaned back. "And having decided *that*, we come now to the final question, namely, whether the Rock is owned by aliens aforesaid, and if so, whether they have certain rights by treaty. I think to state the question is to answer it. And the answer must be, and is, no.

"I will now rule on Mr. Badging's motion to dismiss:

"Motion granted. Case dismissed. No appeal." He glowered at Potts and Sena once more, as though they were guilty of unspeakable offenses against law and humanity. "I want to see both counsel in chambers. You too, Ms. Sena. Just give me five minutes. I have to make a phone call. Court adjourned." He banged the gavel and arose from the bench.

Sena looked up at Potts anxiously. "It's all over. So what's he up to, now?"

Nothing good, thought the lawyer. "We'll just have to go in and see."

7. Bridges That Made History

"Now that it's all over," said Roule, "I thought we might watch the load limit here in chambers, on closed circuit TV." He looked at his watch. "The creeper travelers are loaded with five thousand pounds of steel. No men are on either tower—courtesy of Mr. Badging, I understand. And in exactly twenty minutes the lift motors will turn on and the elevators are going to start up on 'George.' So, we have to kill a little time. I've noticed that you, Mr. Potts, and you, Ms. Sena, have been looking, a bit covertly, I might add, at my pictures hanging on the walls. All bridges, aren't they? And very particular bridges, with one very interesting feature in common. All of them collapsed. Yes, Mr. Potts, that's what bridges do. Bridges collapse. Lawyers orate, grass grows

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green, women have babies, the sun shines, and bridges collapse. It's simply the thing that they do. But come along. While we wait for the George Washington Bridge to collapse, I'll give you the guided tour.

"We'll start way back. Here's Xerxes' bridge over the Hellespont, which he built for his invasion of Greece. Blown away by a storm in 481 B.C. Next, a fictional item: Wilder's bridge of San Luis Rey, just before it breaks. Those six people will be killed in the chasm below. Wilder believed God was doing them all a favor. And here we have a genuine historical structure, a truss bridge designed by Ithiel Town for rail traffic over Catskill Creek in New York state. It collapsed in 1840 and killed a workman; first railroad bridge fatality in the U.S.

"And here's my pride and joy. The photo is 'before,' of course. On December 29, 1876, this bridge fell into this gorge, near Ashtabula, Ohio. With it dropped two locomotives and eleven cars. Eighty died, not counting the bridge inspector, who committed suicide. Amasa Stone, the builder, was disgraced. We still don't know the cause.

"And here's another 'before.' In England, in 1879, this beautiful iron bridge over the Firth of Tay collapsed with a train, killing seventy-five people.

"We pass on. *This* is the Quebec Bridge, over the St. Lawrence. You mentioned this one, Mr. Potts. Actually, the facts were considerably more horrendous than you indicated. The first collapse was in 1907. The south cantilever fell during construction. Seventy-five men died. And, as you noted, the builders actually had prior warning: under the weight of the south arm, the abutment foundation did in fact drop one-quarter inch. After the collapse of the cantilever, they rebuilt, but then in 1916, as they were hoisting the central span, *it* dropped, killing eleven men.

"Next we see 'Galloping Gertie,' the suspension bridge over the Puget Sound Narrows at Tacoma, Washington. After gyrations worthy of a hula dancer, it fell into the abyss."

Potts had witnessed mockery before, including some directed toward him. There were different kinds: some (at one extreme) playful and teasing (as between lovers and good friends); some (at the other extreme) cruel and moronic, as Christ's crown of thorns. But never before had he encountered anything so devastatingly cynical, savage, and sadistic as Roule's present exposition. It was a mockery multiplied by malignance. He found it horrifying.

Roule looked back at the trio. "There are several more, but time is running out, and I'm going to pass on to the final item." They followed him to the far wall. "It's the architect's rendition of our own George Washington Bridge." He added roguishly, "After completion, but before collapse." He leered at Potts from eyes half-hidden under the deep brow ridge. "Impressed, counselor?"

"I am, judge."

"And time is growing short. Let's return to our chairs and watch the screen. The big show is about to begin."

As they took their seats, Potts studied the TV screen. The view was excellent: the giant west tower of the criss-crossing

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steel girders. Strong and light. But not nearly strong enough, and not nearly light enough to survive the collapse of the Rock. From this graceful structure the engineers intended that great wings would form, aft for the Bridge access to the land, forward to connect with the east cantilever already reaching out from the opposite shore.

It saddened him. The engineers intended . . . the state and county planners intended . . . merchants and bankers and builders of villages and shopping centers intended . . . And all these fine intentions would go down the drain.

Sena reached over and took his hand. "Where are they?" she whispered.

"They'll come," he said. But he didn't really believe it. He already counted her as dead.

"I see that the creepers are loaded and ready," observed Roule. "And I'm sure all of you are wondering what's going to happen when they start on their way up the tower. Well, madame, gentlemen, I'll tell you. Nothing is going to happen. And that will prove that you, Ms. Sena, and you, Mr. Potts, are both insane." He smiled wolfishly at the two of them. "Young woman, you're not worth bothering with. But your lawyer is quite another matter. Potts, I've already called the sanitarium. I'm having you committed. The straitjacket boys will be here in ten minutes. Of course, if you want to leave now, you car's out front, and you can make the noon flight."

So *that* was your call, thought Potts. I might have known. He murmured, "It's an interesting coincidence, isn't it. Fenleigh York was on his way to the airport when his car was run off the cliff."

Roule sighed. "Yes, I suppose you have a point. It was most unfortunate. Would you believe, Potts, your friend thought he had uncovered some tasty evidence of corruption in the Bridge Authority. Something about sale of a big block of bonds to me for one dollar. Blatantly libelous. We tried to reason with him. But no. He was determined to take it to the Judicial Grievance Committee, and to the papers. So naive. What a pity. Sad, sad. Don't you agree, Mr. Potts?"

Most interesting, thought Potts. Barton Badging is sitting here, a witness to all this. Either the judge doesn't mind living dangerously, or else the coin expert is inextricably involved in the whole rotten scheme. He tried to catch Badging's eyes, but the other lawyer would not look at him.

The judge was talking to him. "I said, Mr. Potts, don't you agree?"

Potts shrugged. "Whatever," he said absently. His attention was momentarily focussed on the TV screen. A man standing by the creeper traveler was waving to another out of camera view. The traveler was evidently about to begin its upward journey.

Roule looked at Potts sharply. "Have a care, sir. I can include your client in the certif—" His admonition was chopped off in midsyllable.

Simultaneously Badging jerked, and his elbow knocked an ashtray off the arm of his chair. But the ashtray didn't fall. It just seemed to hang there, spilling ashes that didn't fall, either. Very curious, thought Potts. He looked over at the judge, who was now simply a

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very odd-looking statue. The man's face and eyes showed no particular emotion: no fear, no alarm. Then Potts realized that all sound had ceased. The judge . . . Badging . . . the whole room . . . everything was like a still photograph, framed in dead time. He whirled and looked at Sena. She stared back, wide-eyed, then shrugged, as though to say, Don't ask *me!*

Well, at least the two of them seemed to be free. How about outside? How about the Bridge? He looked across the room. No sound was coming from the TV; the scene on the screen was motionless. The foreman's arm was still lifted in immutable signal to someone unseen, presumably the elevator operator. A group of men in hard-hats, who had been walking toward the tower base had come to a complete stop, as though caught in a snapshot.

It was like a scene in *The Sleeping Beauty*, where the fairies cast a spell, and all motion ceases. The king and queen go to sleep. The knights and ladies stop in mid-motion. The butcher's cleaver halts in mid descent. An enchantment of great power falls on everything.

Potts' jaw dropped. Then he slowly closed it. For now he understood. The Dhorans are coming. Maybe they are already here. They have come for Sena. In the nick of time. His thoughts were confused and blurry. How will they do this? What do they look like? He stole a look at the woman. She was peering . . . outward . . . at what? And now it was *he* who was afraid. He held her hand tighter.

The judge's library wall began to glow. The entire section of *Atlantic Reports 2nd* shone, then glittered, then vanished. Potts could see through the wall. See what? Certainly not the parking lot, nor the street, nor the Domestic Relations Annex. He saw things for which he had no name. Brilliant fleeting lights . . . strange-colored, glowing frondy things. And sounds . . . weird, tinkly, harmonious. He knew there was nothing like this on Earth.

Sena let go his hand, stood up, then bent over to kiss him. "I'm leaving now, Oliver."

"They cannot save the Rock?"

"No, it is too late. If I stay, I die when the Rock vanishes. From the Rock, I was made." She hesitated. "Oliver, in all these ten thousand years you are the only person I have ever been able to talk to. There are many wonderful things on Dhora. We could be happy together there. Please come with me."

"No, you know I can't. It wouldn't work. You are immortal, Sena. You would stay young forever, but I would grow old and die. Go, Asena-apeeneniwa, Spirit-of-the-Rock, and let us remember each other."

She gave a wild desolate cry and ran into the radiance.

Atlantic Reports, 2nd, instantly rematerialized.

Life resumed.

The TV screen showed that the creeper traveler, carrying five thousand pounds of steel girders, had begun its ascent.

At this instant the Rock vanished.

For a moment the cantilever tower carelessly and impiously named George seemed motionless, suspended over thirty feet of absolute nothing, as though it had forgotten all about the teachings of

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Sir Isaac Newton. Or perhaps it thought itself hung from some colossal skyhook. But then reality overtook it, and it dropped, silently and leisurely at first, and straight down. There was a brief time lag between sight and sound, as though the makers of this scenario had ineptly failed to synchronize these vital elements of the performance. But finally everything came together, and the impact was seen, heard, and felt in some sort of ragged order in Roule's chambers. The vibrations nearly knocked the TV set off its stand.

In horror and fascination, the three men watched. Sena's absence went unnoted.

True bedrock at the site, thirty feet below the now-vanished Rock, sloped down toward the river, so that the riverside floor of the tower had farther to drop. This caused the tower to fall toward the water. It did not fall in one piece. The skyward sections had farther to go, and they could not be hurried. George in his final Virginia Reel, thought Potts. Truly a titan. The tower broke ultimately into three major pieces, all of which collapsed with grand gestures, as though waving at Martha across the river. Great Soul crying out to Great Soul, mused Potts. The upper sections fell finally into the river with tremendous prolonged splashes that drenched TV crewmen on the Bridge approaches half a mile back from the water.

The earth tremors continued, and the catastrophe now became quixotic. The TV cameras zoomed in on Martha across the river. The companion tower had begun to sway in a slow grand manner, as if opening a stately minuet. It was a strange and complicated movement, combining a sort of back-and-forth rocking with a side-to-side quiver. Things began to fall from the tower, girders, apparently. At first, slowly, and one by one. Then the tempo of destruction picked up, as though a gust of wind were blowing dead leaves out of a tree in late autumn.

With a great sigh Martha shook herself. She collapsed not as an integral piece of lacey steel, but as a jumble of awkward giant jackstraws.

Barton Badging turned slowly to face Potts. The mouth of the President of the Sena City Numismatic Association was a big slack O, and at first the words wouldn't come out properly. "My— My— The— What—?"

Potts waited sympathetically, but there was really nothing he could do.

Finally Badging screamed, then dashed out of the room. "My coins! My ninety-fives! The curse!"

The judge watched this with a chalk-white face. He staggered back to his chair, but he collapsed on the floor before he could reach it. He lay there in a heap by his desk.

Potts shook his head. A stroke? Better call an ambulance. And what a bad time for it! Bet they're all headed out to the Bridge. He started toward the judge's phone, but stopped when he heard steps behind him.

Two burly young men in white jackets stood there, looking at him, then at the figure of the floor.

"Sanatarium?" asked Potts. "Judge Roule's commitment order?"

"Yeah."

"There's your man, on the floor. You'll need a stretcher. And he ought to have immediate medical attention."

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"Okay, chief. You got the papers."

"We'll send them over later."

"Fair enough. We'll have him out in a jiffy. You see the Bridge fall?"

"I did. But it was no big deal. That's what bridges do. Women have babies, grass grows green, lawyers orate, bridges fall."

The two attendants looked at each other as though asking, Do we have the right guy?

Potts appreciated their problem. He smiled, then shrugged, as though to say, It's a good question. "Oh, just one more thing." He strode quickly to the wall and took down the architect's picture of George Washington Bridge. "When he comes to, he'll want this. Just prop it up on his night-stand. Should have a great calming effect on him."

8. 'S' for Sillabub

"Well, Mr. Potts, how was the case in Sena City?" Miss Catlin sensed that Mr. Potts's mind was far away, and had been ever since his return that morning, and she put the question carefully.

"Sena. Fine."

"They treated you all right?"

"Oh, yes indeed. Memorable reception. The judge was remarkably hospitable—wanted to give me free room and board. Opposing counsel unusually helpful. Client's story ultimately understood by everyone. All very much like right here at home."

There was something not quite right in his answer, but she couldn't put her finger on it. She said, "Did you see the bridge fall? They interrupted TV programs all over the country to show it."

"Yes, I saw it."

"Are you all right, Mr. Potts?"

"Certainly. And it's time to get back to Earth. Where were we, before I rushed out last Friday?"

She examined a page in her notebook. "You had just asked me to send a ten-dollar check to the Mount Vernon Trust, and then you got that terrible phone call about Mr. York."

"I remember. Ten dollars?"

"Yes, sir."

"That makes me a member?"

"I suppose. Whatever *that* is."

"I want a second membership, actually a co-membership, for a couple of clients."

"Oh?"

"On the check, just say, 'For Sena and George.' Send the Trust ten thousand dollars."

"Mr. Potts! Are you crazy! You don't have ten thousand dollars!"

With careless nonchalance he handed her the big envelope. "Here's thirty thou, Miss Catlin. It might be best to deposit it before writing any checks. Also, would you please send ten thousand to Fenleigh York's executor."

She eyed him suspiciously. "Can we keep the other ten thousand, Mr. Potts?"

"By all means, Miss Catlin."

"Am I to understand you *won?*"

"No. I lost. The case was dismissed. My record remains unblemished."

She never knew when he was being sarcastic. "I understand there was some more excitement, following the bridge collapse." She watched him closely.

He looked back in total innocence. "Really?"

"I saw in the newscasts something about important people leaving the country. Marcus Reed, Chairman of the Bridge Authority."

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"Yeah. To Brazil."

"And Mr. Badging went with him?"

"That's the rumor," said Potts.

"And we don't have an extradition treaty with Brazil? Mr. Potts?"

"Oh. No, I guess not."

"And that poor man, Judge Roule, still completely paralyzed from his stroke."

"So they say."

She bit her lip. He just wasn't going to talk. All right, then. Back to business here. "There was also the matter of the D.A.R. They wanted you to give a talk. You accepted. They want to know the talk title so they can put it on their programs. Preferably something early American."

"Ah, yes." He interlaced his fingers behind his head and leaned back and studied the ceiling. (Catlin was right, it needed painting.) He closed his eyes, and he saw that tall figure once again. George with a towel about his middle, playing the fife while his underwear dried. Sena at the spinet. That priceless holo—gone now, with Sena's house. So be it. He could still hear the tune. He began to pat his foot. Ah Sena, did you (like Sally Fairfax, like Eliza Powel) ever enliven the Old Boy's dreams in that upper bedroom at Mount Vernon? I hope so!

And so crashing back. Alas. "Tell them the title will be, *1795—Year of Crisis.*"

She beamed at him. She hadn't expected it would be so easy. Maybe he was going to behave, after all. "And now just a little housekeeping matter. Where shall I file this new case folder? Under 'S' for Sena? 'B' for Bridge Authority? 'Y' for York? Or—?"

" 'S,' " he said dreamily, "for Sena. For spinet. For saddlebag. For seventeen ninety-five. For sterility. But most of all for sillabub."

She might have known. Back to normal. ■

IN TIMES TO COME

● Our August cover, by H. R. van Dongen, gives a tantalizing glimpse of Charles Sheffield's lead novelette, "Trader's Secret." Sheffield's Traders, with a capital *T*, are a little different from the more general "traders," though important links will be clear when you read the story, just as the Earth (and environs) of the story are recognizably descended from the Earth we know. Earth and its orbiting offspring face an intertwined complex of technological and sociopolitical problems, in some respects quite new—and in others very old. And, just as they have many times in the past, traders—and Traders—play a key role in resolving them. . . .

We'll also have a variety of stories by such writers as Eric G. Iverson and Eric Vinicoff, and a new fact article by Stephen L. Gillett, Ph.D., involving another matter which is in some senses new and in others old. It's a kind of rocket which did receive some research attention some years ago but was abandoned as too dangerous to work with—then. But it now appears that some of the fuel-handling problems which earlier appeared insoluble may now be within reach, and the things to be gained may warrant a closer look.

And, of course, we continue with Part II of Timothy Zahn's four-part novel *Spinneret.*

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the reference library

By Tom Easton

Ender's Game, Orson Scott Card, TOR, $12.95, 256 pp.
Gods of the Greataway, Michael Coney, Houghton Mifflin, $15.95, 278 pp.
Ram Song, Sharon Webb, Atheneum, $13.95, 218 pp.
Cards of Grief, Jane Yolen, Ace, $2.75, 193 pp.
Gilgamesh the King, Robert Silverberg, Arbor House, $16.95, 320 pp.
The Torch of Honor, Roger MacBride Allen, Baen, $2.95, 331 pp.
The Timeservers, Russell M. Griffin, Avon, $3.50, 240 pp.
The Tides of Time, John Brunner, Ballantine/Del Rey, $2.95, 240 pp.
The Wild Ones, A. Bertram Chandler, Paul Collins Pty., Ltd. (P.O. Box 66, St. Kilda, Victoria 3182, Australia), A$5.95, 205 pp.
Chrestomathy, Keith Laumer, Baen, $2.95, 254 pp.
The Nebula Awards #19, Marta Randall, ed., Arbor House, $15.95, 234 pp.
Light Years and Dark, Michael Bishop, ed., Berkley, $8.95, 498 + xiv pp.
Niven's Laws, Larry Niven, Owlswick Press, $12.00, 108 pp.
The Faces of Science Fiction, Patti Perret, Bluejay, $11.95 (paper), $35.00 (hard), unpaged.

The August 1977 *Analog* novelette that earned Orson Scott Card the Campbell Award for best new writer was "Ender's Game." Now Card has turned that story into an excellent novel: **Ender's Game**.

In *Game*, Card shows us a future threatened by the buggers, insectoid aliens who lack all speech, communicating telepathically; who feel nothing in common with nontelepaths; and who seem intent in two attacks on the solar system on exterminating the human species. To beat them, Earth needs a military leader of unsurpassed genius: quick to respond, creative, uncompromisingly violent yet empathic enough to sense an enemy's intent. To get this paragon, the generals select a couple whose genes

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show promise and draft their infants. But the first proves *too* violent and the second not violent enough. The third—a despised Third in a world that allows each couple only two children—is Ender Wiggin. At age six, he is removed to the orbiting Battle School to learn tactics, strategy, and leadership under extreme pressure. He plays games like any child, but the games are not always games, and the final victory becomes tragic in more ways than one.

Meanwhile, back on Earth, Ender's hateful brother and loving sister, geniuses both, are using the world's computer net. Wearing adult guises to hide their preteen ages, they are writing, debating, and influencing the masses. Their intent? To pull power for themselves from the wars to be fought on Earth after victory over the buggers. The brother especially wants to rule the world.

Game is a tale of manipulation, verbal and nonverbal, of children and mobs, of emotions and fleets. It succeeds because of its stress on the value of empathy. Its greatest villain lacks this quality most. The governmental agents who rule young Ender are as guilty of despicable acts, but they are saved by their ability to bleed for the souls they mangle.

We need not agree that empathy is a brute's saving grace to appreciate the problem Card confronts. Clearly, the evil ones of history—or, better, literature—care nothing for their victims. They relish pain and savor death, and thus in truth do we define evil. Yet heroes can cause as much damage, and if we are thoughtful we must ask just what is the difference between hero and villain.

The historian and the cynic alike say the hero is on our side. He does evil for the sake of good. Of course, the historians of the villain's side say the same, and the labels are cast in bronze medals by the winners of wars. Think of the Holy Inquisition, Vietnam, Israel, etc., ad infinitum.

The relativity of reality defies our wish for absolutes. One task of the fictioneer is thus to reconcile truth and dream, perhaps to find absolutes where there are none. Card, like many others before him, suggests that the absolute *is* empathy, and he does so very well.

Me, I think absolutes of all kinds are purely human inventions. Empathy or no empathy, the brute is evil no matter which side he serves (though I'd rather he were on mine). And Card seems to lean in this direction. Despite his stress on empathy, he goes to great pains to shield Ender's childish innocence from truth, to keep us from calling him one more brute of history.

Read and enjoy, my friends. And reserve your skepticism of Ender's talents, remarkable enough in an adult, much less a little kid. Remember—the kid's a genius.

Michael Coney's **Gods of the Greataway** is Volume Two in the "Song of Earth" series. Number one was *The Celestial Steam Locomotive*; it introduced Coney's novel jargon of greataways and happentracks and ifalongs and posed the problem—the liberation of God (Starquin the Five-in-One) from the hate bombs. Now we meet again the Triad of Manuel, Wild Human, Zozula, caretaker of the neotenic Dreamers, and the girl without a name as they pursue their quest. They learn of the experiment gone awry that produced both the Dreamers and their vicious opposites, the Bale Wolves. They find the Dreamers' cure, the cause behind the alarming deaths of Dreamers in their beds, and the answer that is love. It is a tale told

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sidelong, pieced together and illustrated from snippets of history and records and legend. And it is a breathtaking accomplishment, a work of literature to stand beside—I grope, for Coney is too poetic to be compared with any mere novelist and too dramatic to set against a poet; the best comparison may be Shakespeare. It has the clarity of speech, the imagery of classic SF, and the glory that was Faery.

Do you get the impression that I liked *Greataway* better than *Locomotive*? That the former upgrades the latter retroactively? Right, on both counts. Here we have more lifelike juice, less idealization, greater resonance with reality, while still we retain the charm of noble theater. I fully expect this book to win Hugo and Nebula and whatever else there is in sight. Buy it. You will be delighted.

Sharon Webb closes her "Earthsong" trilogy with **Ram Song**, set not on the starship *Ram* (as I forecast in November 1983) but on Aulos ten millennia after that world's settling by artists, mostly musicians, from the *Ram*. Unfortunately, one of the colony's factions stole the secret of immortality and, banned ever after from polite society, became the gypsy-like Tatterdancers. By the time *Ram* arrives to check on its offspring, Aulos has built a mortal society centered on the metaphors and realities of music. Webb's creation is uniquely intriguing and satisfyingly real.

The story: As *Ram* arrives, space goes berserk and the starship multiplies in its orbit. There are hints of super-aliens disturbed in their homes on the edge of the cosmos. *Ram*, Aulos, and even the universe face destruction, and the immortal Kurt Kraus must learn why and save the day.

It is Kraus's life, from childhood to redemption, that links the books of this trilogy. He found the answer to immortality's dearth of creativity in a mortal caste of artists, the answer to chaos in the talents of mental defectives. Now he must link these elements of his past to find the solution on Aulos. But first he must help answer the personal problems of Tatterdancer Shawm, whose mother's death is one of the book's most moving scenes; medic-in-training Picardy; and apprentice ruler (and pluperfect snot) Dorian. Only then can they help him. Only then can Aulos regain its physical grasp on eternity. Only then can music hope to fulfill its promise of earthly heaven.

Delight your young adult—and yourself—with this one. Perhaps it will encourage his or her imagination to soar like Sharon Webb's.

Billed as fantasy, but SF nevertheless, Jane Yolen's *Cards of Grief* is an astonishing portrait of a world whose natives shape their lives to death. All their arts serve mourning, and it is L'Lal'lor's Grievers who are its poets, musicians, sculptors, and painters.

Into this world is born the peasant girl Lina-Lania, the Gray Wanderer, a self-possessed poetess of remarkable talent. Noticed by a journeying Prince, she is brought to the city to serve the Queen, who orders Gray's grandmother slain to provoke the Griever's talents.

And now come the Terrans, a study team based on a satellite where each year corresponds to ten on the ground. Now comes the anthropologist, who loves Gray and, against all vows, begets a child upon her. Court martialed for cultural contamination, he suffers his sentence and then moves groundside, taking his daughter to an aged Gray and joining his gift of laughter to the native's depth of feeling.

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Cards is a tour-de-force exercise in building a way of life on a single emotional concern so effectively that we barely realize that anything is missing. It is a poignant love story and a well-felt story of first contact. It is even a deft avoidance of the issue of cross-species cross-breeding, for Yolen sows clues that let the acute reader swallow everything.

What are the Cards of the title? They are a Griever's memorial to the Gray Wanderer, a Tarot, and a sensitive record of a time of change. Read the book if you wish to learn more.

Robert Silverberg's **Gilgamesh the King** is a historical novel that should appeal to all who love fantasy or SF, though it is neither. The tale of Gilgamesh, one of the oldest of epics, dates to the time of Sumeria; Gilgamesh may even have been a historical figure, perhaps about 3000 B.C. Silverberg's retelling has the epic feel of the Majipoor books, the grandeur, the sense of destiny, the depth of imagination. To these features, it adds much greater power. I suspended my disbelief far more readily, and I savored Silverberg's vision of that most ancient of days when humans first embarked on the path to civilization and the stars. I thus feel that *Gilgamesh* is one of the most excellent of Silverberg's many fine works. It may be his best to date.

Silverberg gives Gilgamesh a childhood in Uruk, showing his training after the death of his father the king. An archetypal hero, he is strong and tall and smart beyond his peers, in all ways more than human. His appetites and energies are immense, and they will bring him trouble. When King Dumuzi decides he is a threat to the crown, he flees to a rival city, where he becomes a hero for the first time. When Dumuzi dies, he returns to Uruk to be acclaimed king in his turn. He then dives into rebuilding and ruling with such zest that he exhausts his subjects. Even the priestess Inanni, whom he loves, cannot restrain him. That takes the arrival of Enkidu, the wild man, tamed by the holy whore Abisimti, for he alone has the energy and strength to be Gilgamesh's friend. Together they hunt and gambol like young lions. Together they slay a volcanic demon, an excellent example of Silverberg's ability to put a rational face on the supernatural of myth without losing the awe and wonder that engendered the myth.

Then comes disaster. Enkidu dies. Inanni becomes an implacable, bitter enemy. Gilgamesh flees his throne in search of immortality. When he returns, he bears answers of a different sort, and the novel resolves with quiet satisfaction.

Gilgamesh is a tale of the pride that goeth before a fall. It is also a tale of the gaining of wisdom and resolve, of the bicameral mind that once let right-brain gods speak to left-brain humans, of the divine madness that we today call epilepsy. It is an ancient tale illuminated—but not spoiled—by modern rationality.

Roger MacBride Allen's **The Torch of Honor** is excellent conventional space opera. Newlyweds Joslyn and Terrence have just completed training for the League of Planets' Survey Service. Since the Service's borrowed ships are about to be reclaimed, it sends them out undercrewed; Joslyn and Terrence have a ship to themselves. They are busily surveying new worlds when a message torp reaches them with word of a colony enslaved by a hitherto unknown colony set up by Terran fascists. They are to carry the torp's burden—a

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matter transmitting device—to New Finland, set it up so troops can come through, and help scotch the fascists.

Terrence leaves Joslyn aboard the survey ship while he carries out the mission against all odds. Adventure and violence and macho abound, and the ultimate battle, against an immense starship designed to fly in atmosphere as a base for the conquerors, is quite climactic enough.

Allen has a fine technological imagination, a good touch with violent action, and a gift for pace. The novel rarely lets up, and it is a good read. It, and presumably its coming sequel, lack only all trace of true originality.

Russell M. Griffin's **The Timeservers** is a pale incarnation of the diplomatic satire that made Laumer's Retief so popular. The timeservers are the diplomats, who lose decades in relativistic travel between posts and put in futile years on station. Hero Calvin Troy, First Secretary in the embassy on Depaz, becomes Acting Ambassador when his chief is kidnapped by brigands. He must cope with the rival embassy of the crocodilian Albarians, the uplifting meddling of the silicoid Drofsko, robot Shakespearian actors, Papal nuncios, and the stupefying incompetence of the Depazians. In the end he must also cope with the revelation of just how Earth has chosen to staff its embassies in such a way as to relieve "real" humans of the awesome boredom of serving time beyond all dream of kith and kin.

Griffin's great accomplishment here is that he has deftly and aptly captured the sense of futility, the boredom, that must accompany all varieties of timeserving, whether in distant embassies or in prison. Unfortunately, this means that his tale is guaranteed to bore the reader mindless. It has none of the jollity that saved Retief.

John Brunner's **The Tides of Time** is an intriguingly told love story. Earth has found a way to send people to the stars more quickly than light. Unfortunately, the volunteer fartravelers return dead or mad. Only Gene and Stacy have apparently kept their wits.

Or have they? As soon as possible, they leave the project to hide away on a small island. There they become lovers and live fragments of past lives, dipping back deeper and ever deeper into time, always together, ever seeking their identity with their world and their kind. The project's managers find them, bug them, and learn something of how FTL travel strips a person's roots away. Stacy's and Gene's fugue is a desperate effort to regain those roots, and if it fails, it still provides clues to how humans may one day be able to withstand the shocks of star travel.

I enjoyed it. May you also.

The Wild Ones is A. Bertram Chandler's last completed novel (there may be more in his files). It is, as we might expect, a Grimes tale, an adventure, and good. As Captain of *Sister Sue* and secret agent of the Survey Service, he must investigate the slaughter of intelligent aliens on a world settled by religious fanatics. With him go his kangaroid doxies, Shirl and Darleen, and a too-intelligent robot, Clockwork Kitty, gift of his writer father. All three are essential to the mission, though I found it hard to swallow the ease with which Shirl and Darleen communicated with the Selkies, supposedly because they are closer than humans to their animal past.

Enjoy the book, and regret that there will be no (or few) more.

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* * *

Keith Laumer's **Chrestomathy** is a curiosity. It is a collection, but it contains only three short stories. The rest is a baker's dozen of excerpts from the man's novels, chosen to illustrate Laumer's claim that he presents not action stories but "ideas clothed in happenings" and to demonstrate the way he builds his yarns around those key scenes he discovers "in the interGalactic deep under my haircut." All are cute and clever beasts, but few are worth seeking out apart from their parent tales.

The title is a genuine word, meaning a collection of choice passages from an author or authors, especially one compiled to assist in the acquisition of a language. Laumer is thus being exceedingly coy. A current issue of *Analog* would be of more help in learning English, and it would contain more choice passages.

Or—for choice passages—try **The Nebula Awards #19**. It gives you Greg Bear's "Hardfought" and "Blood Music" and Gardner Dozois's "The Peacemaker," which their peers among the Science Fiction Writers of America thought the best short pieces of 1983. There are also Ian Watson's "Slow Birds" and Robert Silverberg's "Homefaring," two of the losing award nominees. All are excellent tales, and Marta Randall's brief introduction puts the whole Nebula process in perspective.

Do you want a larger chrestomathy? Try Michael Bishop's **Light Years and Dark**, an anthology of reprints and originals (some of which their authors had oddly been unable to sell before; proof that "unsalable" does not mean "bad"). The book has no dogs at all, a considerable editorial accomplishment, and I find it impossible to point to a handful of "bests" among its 43 entries. All I can do is say I liked certain ones better than others. Let me mention only Lafferty's "Nor Limestone Islands," Page and Bishop's "Scrimptalon's Test," Cowper's "Paradise Beach," and Tiptree's essay, "Painwise in Yucatan." There are plenty more by Ballard, Wolfe, Zelazny, Benford, Wilhelm, Carr, Watson, Dann, Bryant, Swanwick, Spinrad, Frazier (poems), Le Guin, Priest, Malzberg, Niven, Reamy, etc. Most of the writers "came to prominence during either the 1960s, the 1970s, or the early 1980s" and "define an sf frequently different in both emphasis and style from the sf that preceded it." They are the current generation, whose voices are conditioned by reaction to past SF and by the horripilations of current events.

What will the next generation of SF writers be like? The question is intriguing but impossible to answer save in generalities. Maybe we can expect a further explosion of millennial writing, or a wave of fin-de-siècle pessimism to put the gloom and doom of the sixties to shame. Or, considering the way the planet's demographics promise a spreading of the current Ethiopian difficulties to encompass the rest of Africa, Asia, and South and Central America, we might see determined optimism in the face of personal and social agony, evangelically exhortatory SF. Or, if the present turns ugly enough, we may see a continued boom in pure escapism, fantasy and space opera, and a decline in thoughtful SF. If so, I will regret the change.

Niven's Laws honors Larry Niven's appearance as "Principal Speaker" at the 1984 Philcon. It contains Niven's Draco Tavern stories (one of which you

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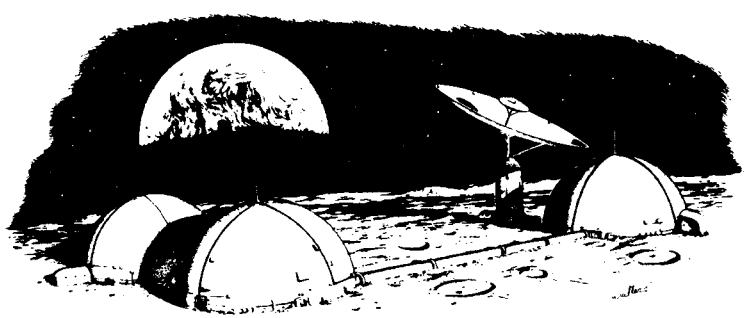
will also find in the Bishop book) plus ten essays, convention speeches of charming verve. The title essay, for instance, tells us never to throw excrement at an armed man or to stand next to someone who is being so foolish. There is a small compendium of convention stories, though Niven refuses to tell the one about Randall Garrett. There is comment on the social impact of instant learning, an argument for radioactive money, and more. Enjoy it, if you can find it.

The cover of **The Faces of Science Fiction** shows us the face of Jack Williamson as an emblem of our field. There is the man, aged, intent on days to come. He wears a cowboy hat, emblem of SF's involvement in adventure. Behind him is a wall of books, a TV set, a VCR. Beside him is the printer of his word processor, sprouting a letter (*not* a manuscript). The photo encompasses all SF, from its roots in Williamson's 1920s youth to today. It sets the genre in past and future and literature as perhaps no other photo could have done.

Faces is the product of star photographer Patti Perret. (Her husband, Mark Bingham, "coordinated" the project.) It began as a storm in the brain of one who knew little about SF. It culminated, says Perret, in "perhaps my best reward of all—I now read science fiction." It is, says Joe Haldeman, the family album of the SF clan, even though it shows us only 82 of the best known members of the family, from Ackerman, Anderson, Asimov, Bear, Benford, Bradbury, Budrys, Cherryh, the de Camps, the Haldemans, Knight, Le Guin, Leiber, Silverberg, and Simak to Vinge, Wellman, Wolfe, and Zelazny.

Most of the writers covered here were kind enough to contribute a personal statement of some kind. Some are so remarkably incisive that *Locus* (the newspaper of SF) could well mine the book for a "Thought for the Day" filler. A few writers donated short poems. A few seem churlish, saying nothing or little. At least one got off by donating a piece of previously published material. Yet the whole deserves an honored place in any collection of SF, right beside the pictureless *Dream Makers* volumes of Charles Platt.

Faces' biggest problem is that it tells us nothing about the writers beyond what is contained in the photos and statements. I look forward to the day when we can have for the same shelf Jay Kay Klein's collection of "Biolog" pieces from *Analog*. That would be a natural for an *Analog* Book, and for all I know it's in the works now. ■



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brass tacks

Editor:

I wish to reply to Ben Bova's guest editorial in the November issue. I differ with him in the projected course of events that deployment of a space-based anti-missile defense system would generate. For simplicity, I shall call this system Star Wars, after the name given to President Reagan's speech.

First, I would like to point out that Star Wars is really *First Generation* Star Wars—as with any weapons system, there will be an impetus to improve and upgrade and, eventually, replace the original equipment with "better" equipment. This point, which I have not yet seen stated directly in any arguments about Star Wars, is very important in the following way:

First Generation Star Wars, as presently conceived, is designed to destroy land-based ballistic missiles as they launch. It cannot be used against cruise missiles, bombers, or covertly delivered weapons; I do not think that Star Wars can be used against sea-launched ballistic missiles, but I could be mistaken; and in any case Star Wars could not be used against depressed-trajectory SLBM's. Because it is only used *in response* to launchings of missiles, it is called a defensive system, and rightly so. (I am overlooking, i.e. giving the benefit of doubt, its use against space-based targets such as satellites.)

Second Generation Star Wars would probably be able to destroy cruise missiles, SLBM's and depressed-trajectory SLBM's, and bombers. It would still be useless against covert attack (any Star Wars system would be useless). Because of its capabilities, Second Generation Star Wars could also be used against other kinds of aircraft, such as fighters *or commercial carriers;* against ships at sea; against space-based targets, of course; and possibly against small

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targets like automobiles (Third Generation Star Wars will certainly be capable of this).

I would be very much surprised if, somewhere in the US intelligence community, there has not been a study made of the applicability of Second or Third Generation Star Wars capabilities to covert operations, like assassination or counterinsurgency—a spy trawler sinks at sea, a plane carrying an important government official crashes. Accidents happen all the time; instead of mining Nicaragua's harbors, the CIA might have used a Second Generation Star Wars device, had it been available. And so on.

Notice that Star Wars, from Second Generation onward, is no longer a purely defensive system but can be used offensively also. The Star Wars-generated "defensive" arms race that its proponents are so fond of turns out to be just another "offensive" arms race in disguise—and offense-oriented arms races do *not* lead to the defense-oriented world that proponents say Star Wars will.

The second topic I want to take up is countermeasures, which I have yet to see the proponents of Star Wars discuss (I do not mean that they have not talked about it, just that I have not seen anything—and I consider myself an informed citizen on this subject). I shall approach this topic this way: What would the US do if the USSR had already deployed a First Generation Star Wars beam weapon system?

Several ideas spring to mind:

1. "Harden" our missiles with ablative or reflective surfaces;
2. Rotate the missiles when launched, to dilute the beam effects;
3. Build more land-based missiles, and missile decoys.
4. Build high-speed, i.e. short boost phase missiles (Star Wars is designed to detect and destroy missiles in their boost phase);
5. Deploy more SLBM's and depressed-trajectory SLBM's;
6. Deploy air-launched and sea-launched cruise missiles in large numbers;
7. Deploy more intermediate range missiles, and in general move our missiles closer to their targets (of course, this forces the USSR into a "launch on warning" position);
8. Develop covert delivery systems for nuclear weapons (there was a story about this idea in the same issue of *Analog* that Ben Bova's editorial appeared);
9. Develop stealth technology for bombers and cruise missiles;
10. Develop some way to mask the infra-red signature of a boosting ballistic missile, to prevent its detection;
11. Deploy more bombers;
12. Develop anti-satellite weapons systems (this was the subject of one of Ben Bova's Kinsman novels—in that novel, the Star Wars arms race brought the world to the brink of nuclear war. . . .)'
13. Develop space-based ballistic missiles.

Note that *most* of these countermeasures are cheaper than the Star Wars system; note also that these countermeasures enhance our *offensive* capability.

Again, far from leading to a defense-oriented world, Star Wars leads to another offense-oriented arms race. Now we have two new arms races: a Star Wars race, and a countermeasures race.

Third, the cost of Star Wars is projected at about a trillion dollars; proponents also maintain that Star Wars will give new life to the US's troubled economy. Based on previous examples

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of military/defense weapons projects, my reasoned, *conservative* guess is that Star Wars will cost four to five times the projected cost. Furthermore, the money to finance Star Wars must come from government borrowing from the public and private sectors of the economy; considering the gigantic funds needed, this could produce such severe competition for credit as to cripple large segments of our economy. The aerospace/defense industry would benefit from the large influx of funds of course, but the aerospace/defense industry is not the whole economy. Star Wars could conceivably bankrupt the US—and given the interconnectedness of the international economy, Star Wars could conceivably bankrupt the Free World.

Fourth, nowhere have I seen any plans for what will be done with the US's nuclear arsenal once Star Wars is deployed. Going by President Reagan's statements at the second Presidential debate, one could assume that the arsenal would be disassembled or destroyed. I find that assumption unlikely. My guess would be that the US would hang on to its nuclear arsenal for use as a threat to other "unfriendly" nations, such as Nicaragua or Syria. I believe that some defense policy makers see Star Wars as a way to restore the nuclear advantage the US enjoyed at the end of World War II.

Again and again, Star Wars does *not* lead to a defense-oriented world: a nuclear advantage can *not* be construed in any way as defensive.

Star Wars is a *technical fix* for the nuclear arms race, but it is not a solution. The nuclear arms race and the potential destruction of human society is not a technical problem but a social and political one. Star Wars is our generations's "atomic airplane": a technological solution in search of a problem, with no useful social or political purpose—or even military purpose, at that.

MICHAEL OWENS

Los Alamos, CA

The Author replies:

It would be impossible to reply point by point to reader Owens's comments without taking up most of the pages of this issue. Suffice to say that each point raised is discussed thoroughly in my book *Assured Survival* (Houghton Mifflin Co.). The one thing to remember, though, is that the new defensive technologies do not apply only to satellites and ballistic missiles. They are *already* being developed into "smart weapons" that will make the tanks, artillery, planes, and ships of conventional land and sea warfare little more than expensive and very vulnerable targets. "Star Wars" technologies (plural!) can make all forms of aggressive warfare so difficult that an era of worldwide peace is in view—if the nations of the world want peace.

As for my novel *Millennium* (not *Kinsman*, its prequel), it was not the race to build defensive systems in orbit that brought the world to the brink of nuclear war. In that novel, it was only the presence of such orbital defenses that *prevented* the war that both superpowers were heading into.

On a different subject, I thought the December issue of *Analog* was one of the best in a long time. Geoffrey A. Landis's "Elemental" was good fun, and Fred Pohl's "Criticality" was the kind of story that only he can produce: funny, but with bite; human and thought-provoking. Harry Stine's "Alternate View" and Stephen Gillett's article about terraforming Venus were unusually interesting. Congratulations to all—and to the Editor who selected them!

BEN BOVA

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The following letter was addressed to Alan Vaughan:

Dear Alan,

I recently ran across your article, "Toward a Technology of Psi," published in the November *Analog*. With one exception I liked it very much. The exception has to do with a misinterpretation of comments in my 1975 PA Presidential Address specifically regarding replicability in parapsychology and in psychology. On page 59 of the *Analog* article, referring to my paper, you say, "By comparison, experiments published in the *psychological* journals repeated earlier findings at the rate of less than one percent." This is incorrect and quite misleading. The error occurs in connection with a survey by Bozarth & Roberts indicating that less than 1% of the published reports they surveyed were *replication attempts*. This is, of course, very different from saying that psychological studies "*repeated earlier findings* at the rate of less than one percent."

It's easy to see how this error occurred and I think you'll agree that it calls for a correction.

CHARLES HONORTON
Director, Psychophysical
Research Laboratories
Princeton, NJ

Dear Mr. Schmidt,

I was greatly entertained by Tom Easton's review of Harrison's *West of Eden;* like him, I greatly enjoyed the story line and the idea of the world-without-meteorite, but for reasons which will become apparent I deplore his criticism of the biology.

Dinosaurs, says Easton, were warm-blooded. But only some of them, I think, if indeed *any*, were real endothermic homeotherms like their descendants the birds, or like mammals (i.e. made and maintained their own heat continually, from inside). Most biologists now (again) think that they were more like modern giant reptiles, cooling somewhat during rest. Anyway, what have dinosaurs to do with Harrison's Yilané? Those are *mosasaur*-descendants—and mosasaurs (fish-lizards) were much more like modern monitors, not dinosaurs at all (I guess Easton reckons anything ending in -saur was a dinosaur. . . .). Yilané are portrayed as homeotherms, too, not "cold-blooded" as Easton claims. Indeed, Harrison's plot (and the complex language invented by Tom Shippey) both tie in to the Yilané *ectothermy* (warmth partly from outside), so that they exploit temperature differences in the environment, in contrast to the mammals who control local environmental temperature to make "nests." The contrast is not between "urbanite villains" and pastoral humans, as in Easton's interpretation, which results from lack of understanding of this biological contrast. The more subtle contrast we intended (I am the biologist Easton was criticizing) was between the Yilané, long-term conservationists because short-range exploiters of temperature differences, and the mammalian endothermic humans, careless of long-term change in the interests of keeping their nests warm *now*.

Perhaps I could direct the rest of this letter, through your column, to Tom Easton more directly. A slightly more careful reading (our fault for not underlining it . . ?) could have given him cause to enjoy rather than carp at our working out of the alternative evolutionary path to "humans" (Tanu). We agree that they must have evolved in the tropics, but in South America (not the cold North where we find them now). We carefully put in the marsupial sabertooth as companion to Tanu, to empha-

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size parallelism in similar evolutionary stocks on different continents. But we think the "humans" on that world evolved from creatures much more like our New World monkeys than like our ancestor *Ramapithecus* (their anatomy is not like ours, in ways which are not explicit in the end-pictures of *WOE*. . . .). Perhaps it happened, on that world, that *Proconsul* got a lift to South America when the Atlantic was not so wide—the fossil record of the primates is no better on the Yilané world than on ours (for the same reasons), so we can't be sure of the provenance of the human parallelism. But Tom had better watch for the next book, because there the differences of the Tanu from us *are* made much more explicit, and are important to the plot.

In the explicatory appendices, Harry put in a lot of our thinking about the design of this world (with several touches of whimsy—the 8-base geological history caught Tom, as it caught me first time around). There are a few unintended biological gaffes (and some "in" jokes), but all of the criticisms voiced by Tom Easton are, I'm afraid, the result of a too-superficial acquaintance with the subject, apparently gained from elementary school popularizations, rather than the state-of-the-art science which the Analog reader has come to expect.

JACK COHEN
D.Sc., F.I. Biol.
Birmingham, England

Dear Stanley,

Analog has always been a magazine close to my heart. Many of my novels first appeared here as serials. True to "Brass Tacks" tradition, after they were published readers would then hammer away at technical points and I would rush to the defense. You have a hard-nosed, hard-headed readership. So permit me then to wade in once more concerning Tom Easton's admirable review of my novel *West of Eden*. He enjoyed the book, enjoyed the concepts, enjoyed reading it. That is what SF is about, why I in turn enjoy writing it.

Mr. Easton, however, does not like the science in the book. Dr. Cohen has written you about the biology, so I won't mention that. I want to reassure him that I did not "blow it" as he unhappily believes with "gaffes . . . in biology, climatology, anthropology." And there was no "simple haste" involved. Quite the opposite—the book took five years to write.

Climatology is easy. *If* the meteor did not strike (and part of the accepted theory of the meteor strike 65 million years ago was that it hit the ocean and plunged through the mantle—where Iceland stands today) then the resultant ice ages would not have occurred as we know them. So I can easily have the world entering an ice age in the 20th century.

As for anthropology: My "humans" are not 'noble savages', but quite the opposite of those old and outmoded ideals. They are typical hunter-gatherers. Nothing I have written violates anything known or surmised about these people, as a quick look through Carleton S. Coon's *The Hunting Peoples* will show. In addition, Dr. Leon E. Stover, Professor of Anthropology, who checked the manuscript, would be immensely put out to think there were any "gaffes" in the book.

I hope this will ease Mr. Easton's doubts so he will be able to enjoy the rest of the trilogy.

HARRY HARRISON ■

● Civilization was born of curiosity, and can be kept alive in no other way. Louis L'Amour

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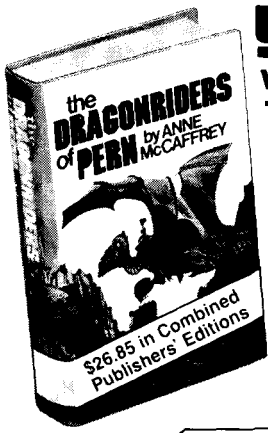

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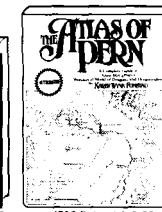

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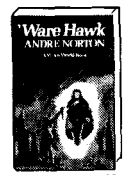

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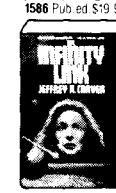

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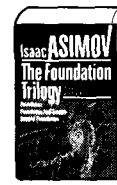

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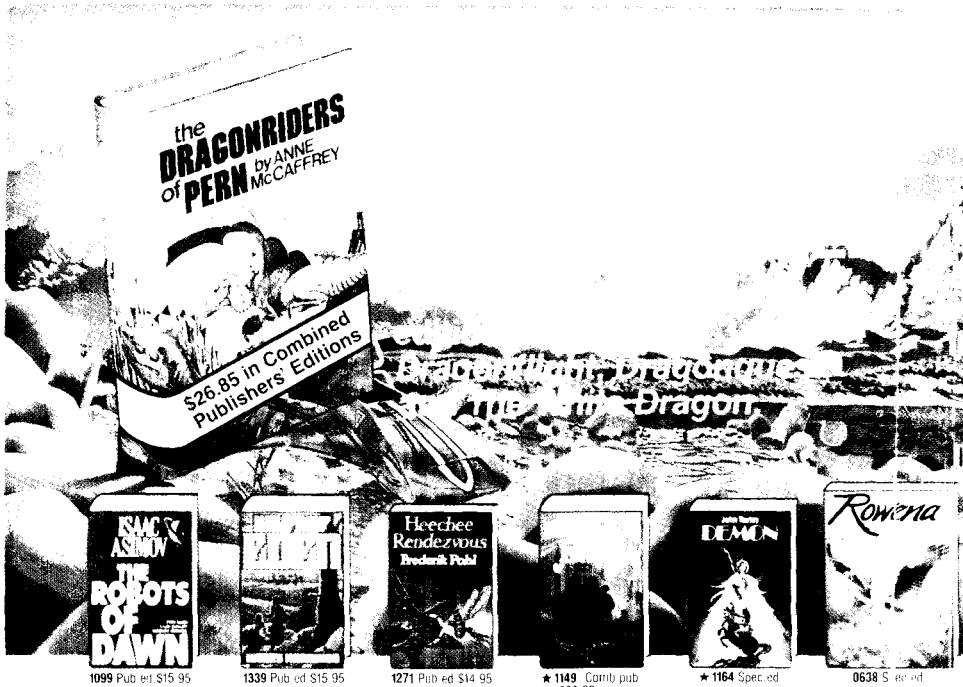

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